

Technical Credentials Not His Long Suit

By Jeffrey Beeler

CW West Coast Bureau

OSEMEAD, Calif. — In a discipline filled with technical specialists and "bit fiddlers," Bert Umbaugh is one computing professional who likes to think of himself as a generalist.

For example, he once managed a large application programming staff and can still "spec" software with the best of them. But by his own admission, technical credentials have never been Umbaugh's long suit.

He never received a degree in computer science, and when he sat down to write his first Fortran program 17 years ago, he "didn't

know beans about math."

To some, the lack of a formal DP education might seem a serious handicap in the fast-moving, technology-conscious computing field. But for Umbaugh, a non-DP background has proved a valuable professional asset.

Broadened Horizons

Realizing his training ill-suited him for a career as a Fortran programmer, Umbaugh found himself forced to broaden his professional horizons. To be sure, he continued to give his all as a Fortran programmer, and he gives much of the credit for his professional

success to his ability to master the nuances of business language and thought.

"All the way through my career, I've avoided like the plague talking about DOS, IMS and all the other gobbledygook most DP people really love to use," he said.

In the company of fellow DPers, Umbaugh frequently finds computerese valuable as a means of exchanging complex information efficiently. Among top general management, he "absolutely refuses" to regress to his profession's notorious technical jargon.

Instead, he talks about "return on investment, earnings per share and the things

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COMPUTERWORLD

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DPers Starting At 10% More

By Ann Dooley

CW Staff

NEW YORK — Starting salaries for DP directors, systems analysts and programmers rose nearly 10% overall in the last year, outpacing the percentage gains of other DP job categories, a recent salary survey indicated.

Systems analysts in small and medium-size installations, DP directors at large sites and programmers working in medium-size and large installations, in particular, will earn significantly higher 1980 starting salaries, according to the Robert Half, Inc. personnel agency.

(Continued on Page 6)

IDC Forecast for 1980:

DP Outlays to Exceed \$50 Billion

By Marcia Blumenthal

CW Staff

WALTHAM, Mass. — User spending on computer operations will surpass the \$50 billion mark during 1980, according to a market research firm here.

And International Data Corp. (IDC) predicted that users will spend more than \$100 billion for information processing by 1985.

The \$54.2 billion expenditures expected this year would be an increase of 14.5% from the \$47.4 billion level of expenditures in 1979, the firm indicated. The 1979 expenditures were up 16.2% over the 1978 levels, although

IDC had predicted a rise of only 14.4% in 1979.

By far the largest category of the DP budget — and one of the fastest growing — will be staff-related expenses, which will take up 51.8% of the users' dollars during 1980, roughly the same slice of the budget as in 1979.

Staff budgets will be growing slightly faster than the overall department average, IDC noted, predicting that such spending would rise by 17% during 1980 to a total of \$28 billion.

About \$23.4 billion of this will be spent on salaries, with an additional \$1.8 billion going for travel, training

and payroll taxes.

Of salary payouts, 41% will go to analysts and programmers, 15% to management, 10% to technical support, 9% to data entry personnel and the remaining 25% to personnel involved in clerical or equipment operations.

Hardware Spending

Following personnel, hardware is the second largest DP budget category, pegged at about 33.7% of users' budgets this year. Within this category, spending is projected to hit \$18.2 billion this year, up a modest 9% from last year's hardware outlays of \$16.7 billion.

IDC's projection for hardware growth during 1979 was 12%, but acc-

(Continued on Page 8)

Operating System for 8100 Delayed

By Tom Henkel

CW Staff

WHITE PLAINS, N.Y. — IBM has delayed delivery of a major operating system for its 8100 line of CPUs, *Computerworld* learned last week.

The postponement of the Data Management System/Distributed Process-

ing Programming Executive (DMS/DPPX) came on the heels of an announcement last November that the DPPX/Cobol option for the 8100 will also be delayed.

Both packages have been held up for "additional integration testing," IBM said. It will announce on March 3

when DMS/DPPX will be released; DPPX/Cobol will be released in April, a spokesman said.

Spacing problems and an insufficient error-reporting system seem to be the cause of Cobol problems, according to one user who has DPPX/Cobol under IBM's Early Support Program (a test site).

Programs submitted in DPPX/Cobol "terminate with insufficient information to immediately determine what you need to do to solve the problem," the DP manager at the test site said.

The Cobol problems are serious but "not insurmountable," he added, noting that IBM has been monitoring DPPX/Cobol's performance in efforts to iron out its bugs.

Users also claim that two IBM program products that operate with DMS/DPPX will be delayed. Those packages are an extended memory support package and DPPX/Host Command Facility (DPPX/HCF). IBM says the extended support package is not an officially announced product. The spokesman added DPPX/HCF will not be delayed.

(Continued on Page 8)

County Trades in IBM 3286s, Gets Same Features for 15% Less

By Jeffrey Beeler

CW West Coast Bureau

RIVERSIDE, Calif. — Users switch printers for many reasons. Some do so to improve their output quality; others, to gain special features necessary to their applications; and still others, to boost their overall system reliability.

But many users change printers for the simplest and most basic reason of all: to save money. One such economy-minded user is the Riverside (Calif.) County government.

Until 1977, the county's DP department had generated most of its user

output with a series of IBM 3286s. But when department staff members realized competitive printers could provide virtually the same user features as

CW Special Report on Computer Output Equipment follows Page 70.

the 3286 for less money, they decided the time had come for them to change their method of producing output.

The search for a 3286 replacement began with the formation of a

(Continued on Page 8)



A Hoax, Folks

Texas Instruments, Inc. didn't really move its minicomputers onto the Olympic slopes this way, it just took this picture "to contrast the latest in DP equipment with the oldest means of winter transportation." The minis were used for on-site scoring at the games. Stories on Pages 6 and 7.



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After the Current Freeze

Tougher DP Export Controls Eyed

By Jake Kirchner

CW Washington Bureau

WASHINGTON, D.C. — The Carter Administration will soon recommend more stringent criteria for the types of computer hardware and software that can be exported to the Soviet Union once the current trade freeze is lifted, Administration officials told Congress last week.

"For our long-term security, we must be more restrictive," Dr. William J. Perry, under secretary of Defense for Research and Engineering, told the Senate Permanent Subcommittee on Investigations last Wednesday. (See related story on Page 11).

Reporting on the Administration's review of U.S. export policy vis-a-vis the Soviet Union, ordered by President Carter after the Soviet invasion of Afghanistan, Perry said the U.S. will back off from guidelines proposed in 1979 that the U.S. and its Coordinating Committee (Cocom) allies are now considering.

In the meantime, the U.S. has asked its Cocom partners — Japan and the North Atlantic Treaty Organization nations, excluding Iceland — to honor the 1976 guidelines, currently in force, which restrict exports to communist countries of any computer mainframe with a process data rate greater than 32 million bit/sec. The 1976 guidelines are "substantially more restrictive" than the proposed 1979 guidelines, Perry said.

Negotiations on new guidelines, which have not yet been revealed, are scheduled for completion by April 1, according to the Commerce Department.

The department could not say how long the new review would delay those negotiations, if at all. Commerce would only say the U.S. will recommend tougher criteria for export license approval.

In addition, the Administration is "preparing proposed new restrictions on the transfer of 'intellectual property' such as computer software, technical data packages and processing know-how," he said.

Although no details of the restrictions have been made public, Perry said the review will soon be completed. In the interim, the U.S. has asked its allies to use the 1976 guidelines.

The revamped guidelines will mean "significant changes in the nature of sales to the Soviet Union. Yet they permit substantial sales of end-product equipment," Perry said. "Unless the Soviets link the purchase of equipment to the supply of technology, as part of a package deal, the adverse effect on computer companies should be relatively small."

'Appalled' at Ethics

But if the Administration is concerned about the impact of the trade freeze and future restrictions on U.S. computer firms, members of the Senate subcommittee clearly were not.

Congress has been upset that it has been all but ignored in the decision-making process Carter initiated in January when he called for the export review. Several senators took the occasion of last week's hearings to blast the current export administration process as well as companies that have been

exporting to the Soviet Union.

Arguing that pressure from the U.S. business community has led the Commerce Department to hastily approve export licenses for high-technology goods with possible military applications, Sen. Henry Jackson (D-Wash.) said he is "appalled" at the ethics of U.S. exporters. "To them the buck comes first," he said. "They come in with the damndest sophistry I've ever heard to try to justify these sales."

Agreeing with Jackson, Sen. William Cohen (D-Maine) said that for U.S. computer firms, "the profit motive has outweighed their instinct for safety and survival."

The subcommittee was equally displeased that Commerce did not take this review action until after the invasion of Afghanistan, despite longstanding evidence that Western computers have been diverted for Soviet military use.

"Responsible officials have so relaxed export criteria that the system is now incapable of providing effective protection for our national security," Jackson said. "There is a serious question in my mind that the department ought to administer this program."

Homer E. Moyer, Commerce Department general counsel, assured the Senate panel that the current review is comprehensive and will produce long-term changes in export policy, giving particular attention to "the special problems created by computers" and the problems of diversion and leakage of hardware and technological information through third countries.

This Week

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Who'll win the biggest prize in American politics next year? Will it be Jimmy, Ted, Gerry, Jerry, Bob or Big Jawn? Or some Dark Horse crouched hopefully in the wings?

Frankly, we haven't the foggiest notion about *that*. But — fearless as ever — we will go out on a limb and make the following astonishing prediction: *None of the above will get as much of the popular vote as SyncSort just received in its election.* (Remember, you read it here first!)

Because this year — for the third time in a row — SyncSort OS won the "Great Sorting Election" by an overwhelming margin. Of the 4,000 OS and OS/VS users in the U.S., a whopping 62% — or 2,480 — chose to sort with SyncSort. (Not bad for a sort program that started out in a log cabin!)

And what about our competitor? Well, it's bad news for the three OS sorts sponsored by the Distinguished Gentleman from the Great State of Armonk. Together they only received 29% of the vote — down from 42% the year before.

The figures quoted are taken from the third annual sort-program survey conducted by the International Data Corporation. Here's what they found out about sort-program distribution in America:

U.S. Market Share — Percentage			
	July 1, 1977	July 1, 1978	July 1, 1979
SyncSort	43%	54%	62%
IBM	53%	42%	29%
Other	4%	4%	9%

If you'd like a copy of the full report, please let us know. It's available to everyone, including IBM and hopeful politicians.

Why does the voting public prefer SyncSort OS by 2 to 1 over IBM's 5740-SM1, 5734-SM1 and that old "freebie" SM023? Well, we just have to fall back on that political cliché — leadership and performance in office.

Leadership because over the past decade we've come up with almost all the advances made in sorting. As a result, we're increasingly known as "the sorting house." And that hasn't hurt us a bit at the polls.

Then there's performance. If you benchmark SyncSort against any IBM sort, you'll notice a sharp decrease in the amount of computer resources that go into sorting. On average your "sorting taxes" will drop 20 to 50%

And do you know anyone who'll fight for higher taxes?

Amdahl Planner Sees IBM Replacing IMS in '80s

By Jeffrey Beeler

CW West Coast Bureau

PALO ALTO, Calif. — IBM will probably replace IMS with a new data base management system (DBMS) sometime during the latter half of the 1980s, according to Amdahl Corp.'s principal planner, Dr. Herbert Hellerman.

Describing his prediction as a "very personal opinion," Hellerman told attendees at a recent seminar dealing with IBM's evolving network strategy that IMS' successor will probably be based on a relational model.

Hellerman's comment about IBM's possible long-range DBMS plans was only one of many technological forecasts he made during the seminar, held here Feb. 13-14 by the Yankee Group of Cambridge, Mass.

Almost every corner of the large-scale IBM-compatible mainframe sector will feel the impact of technological advances and changes during the next 10 years, Hellerman made clear during a one-hour seminar presentation. On the software and services front, he predicted, users can expect vendors to increasingly unbundle their operating systems and centralize or automate their CPU support.

By decade's end, Hellerman explained, the number of large-scale computing installations will have grown so much that mainframe vendors will no longer have enough skilled technical personnel to maintain them all. As a result, suppliers will be forced to perform more and more of their hardware maintenance from remote locations.

Field-support engineers will still be available to make on-site service calls, if necessary, but users will have to pay an increasingly high premium for their time, Hellerman said.

The expected trend toward unbundled software, meanwhile, will stem primarily from falling equipment prices, he added. As hardware's importance as a revenue source steadily declines during the 1980s, large-scale

systems vendors will be forced to rely increasingly on software to buoy their earnings levels.

Cost per Mips: \$7,000

On the hardware side, Hellerman said users can expect continued price/performance improvements in both logic and main memory. By 1986 or 1987, the price of 1M byte of main memory will drop to \$7,000, compared with \$50,000 for the same storage capacity today.

At the same time, the cost of computing one million instructions per second (Mips) will fall from \$500,000 to \$600,000 today to \$150,000 to \$200,000 six or seven years from now.

Much of the expected improvement in logic price/performance will result from the emergence of increasingly powerful circuitry. By 1986 or 1987, Hellerman forecast, Mips rates for

typical large-scale CPUs will range from 25 to 30, compared with 6 to 7 Mips for current models.

Serious Problems

Although improved execution speeds ensure increased processing power, they will also pose serious problems for which mainframe vendors will have to devise solutions. First, rising Mips rates are likely to result in unbalanced systems by widening the speed gap between processors and their much slower direct-access storage devices (DASD), Hellerman said.

Second, increased processing speeds will force mainframe vendors to expand their machines' internal memory capacities far beyond the current maximum of 16M bytes.

To narrow the speed gap between processors and disk units, IBM-compatible systems suppliers might

eventually have to devise DASD cache memories similar in function to caches already used extensively with CPUs, Hellerman said.

To meet the demand for increased main memory capacity, meanwhile, vendors will probably enlarge their machines' address spaces from the current 24 bits to 31 or possibly even 32 bits, the Amdahl product planner added. Extended addressing will allow processors' storage capacity to be expanded as much as 2G bytes.

In other forecasts of main-memory technology trends, Hellerman told seminar attendees that 64K-bit memory chips would become widely available between 1983 and 1986, possibly sooner, and that 256K-bit chips would appear sometime after 1985. During the next six years, he added, cycle times for cache memory will decrease from 20 nsec to 8 nsec.

Technical Credentials Not His Long Suit

(Continued from Page 1)

business people are really concerned with," and he "makes a real effort to present DP ideas and plans in those terms." When lobbying for a new piece of hardware, for example, Umbaugh tries to show his superiors how the proposed acquisition will benefit the company as a whole and avoids justifying the installation for DP reasons alone.

Another reason Umbaugh cited for his professional success is his ability to communicate effectively. "I realized very early that being able to express yourself, having a reasonable command of the English language, is invaluable to corporate advancement," he said.

Coming from a long-time DPer, Umbaugh's statement about the importance of effective communication might seem a little incongruous, but then again the former DP manager's professional life has been atypical almost from the very outset.

His career began at Bell Laboratories, Inc. in 1963, the same year he graduated with honors from Pennsylvania State University with a B.S. degree in biology and English. During his first months at Bell Labs, Umbaugh was assigned to an in-house training group where, despite his lack of formal computing instruction, he was asked to write a simple Fortran program for calculating the sag of suspended telephone cables.

Using an elementary Fortran programming manual as a guide, Umbaugh learned the intricacies of code writing and produced a 70-line program in near-record time. The program compiled and ran the first time; more importantly, however, it helped lay the groundwork for much of his later career.

After his brief stint as a trainee ended, Umbaugh joined Bell Labs' personnel department, where he helped establish a programmer training course, then moved to the company's

technical recruiting section for about a year.

In 1966, Umbaugh left Bell Labs to become manager of technical training



Robert Umbaugh

at TRW Systems, Inc.'s Redondo Beach, Calif., site. About 18 months later, he joined Computer Usage Co., where he served first as personnel director before being promoted to vice-president in 1969.

From Computer Usage, he went in October 1971 to Southern California Edison, where he held a succession of computer-related jobs until he finally became DP manager in 1974.

For computing professionals hoping to emulate Umbaugh's climb from the DP ranks to the management heights, the Edison vice-president has no magic formulas, but he did offer a few bits of advice based on personal experience and observations.

To rise to the upper corporate echelons, he said, computing professionals first have to gain a firm understanding of how their own discipline fits in with their employer's overall needs, goals and organization.

"They have to understand what their function does and does not do for the corporation, and they have to learn to relate that function to the company's fundamental reason for being," Umbaugh explained. "If they're in the insurance business, they're going to have to demonstrate their worth as it pertains to insurance policies."

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With 'Strategic Architectural Plan' IBM Seen Remediating Software Incompatibilities

By Jeffrey Beeler

CW West Coast Bureau

PALO ALTO, Calif. — IBM will almost certainly make a strong effort during the next few years to resolve the many "inconsistencies and incompatibilities" within its software and data base product lines, a Mitre Corp. official predicted here recently.

The remedy for IBM's current software shortcomings will probably take the form of a "strategic architectural plan" that will address unmet user requirements for improved programming features, according to Mitre's DP Task Force leader, John P. Hogan.

As it has in the past, IBM's architectural plan will continue to rely heavily on microcode, Hogan said at a Yankee Group-sponsored seminar here dealing with IBM's evolving network strategy. In the relatively near future, users can expect IBM to start configuring its large-scale systems around clusters of dedicated processors, each microcoded to perform a different system function.

Under such a scheme, users would offload a file access function or a whole data base function into a separate CPU and "use microcode to facilitate the interface to the main processor and input/output devices," Hogan said in a paper presented at the seminar.

Subsystem Functions

Users can also expect IBM to microcode many of their current operating system and subsystem functions.

To accomplish that feat, however, the firm will have to understand these functions well enough to implement them first in software.

"It makes little sense, for example, to microcode a data base management system [DBMS] into a processor when there are no particularly good DBMS implementations on the market today to use as a proven model," the Mitre task force leader explained.

Common Operating System

In addition to microcode, IBM's future architectural strategy will depend heavily on the company's MVS, VM/370, VSI and DOS/VSE operating systems. Although IBM will continue to offer the four software products for some time to come, Hogan said, the firm will slowly remove their incompatibilities during the next five to 10 years and eventually give them a common architecture, with a shared language, interfaces and access methods (chiefly Vsam and Vtam).

As part of its evolution toward a common operating system environment, IBM is expected to add some key software features, including:

- A shared interprocess interface consisting of two parts, one for interfacing processes in the same CPU cluster and the other for interfacing processes in different parts of a network.

- A system dictionary/directory that would define all the objects, not just the data objects, in a system and network.

- A common storage management facility that would be used by Vsam for input/output requests, by virtual memory management for paging and by a DBMS for data access.

In the past, Hogan continued, the absence of an effective architectural strategy within IBM's product line has caused the firm's users some serious headaches, many of which persist to this day.

One of the most significant problems is the requirement that applications be tailored to the operating system in which they run. Because of this constraint, users "still must employ expensive systems programming special-

ists with access method and communications skills to design operating system-dependent interfaces," the Mitre official said.

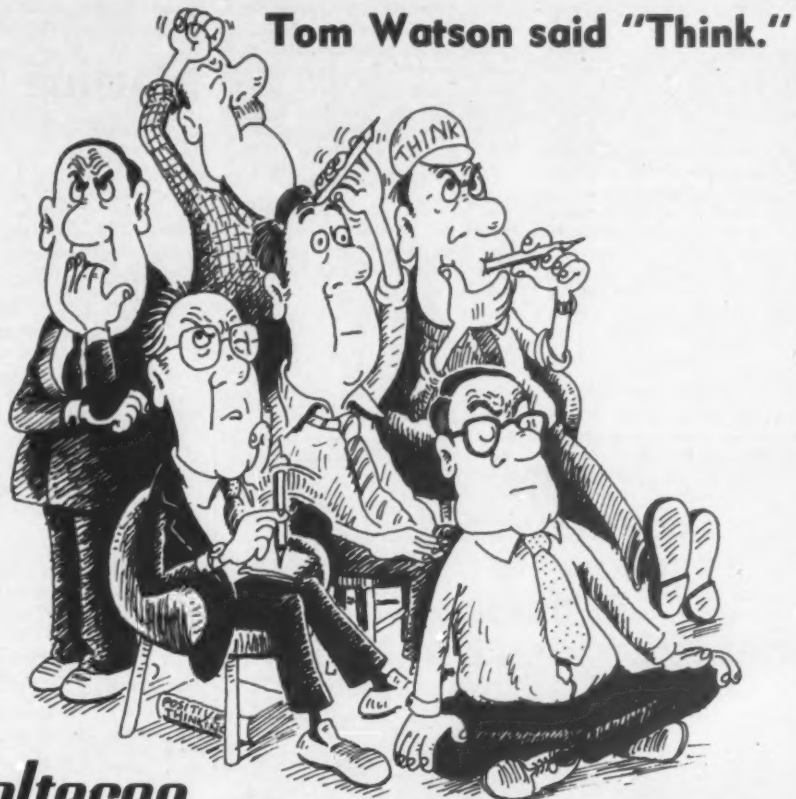
Component Incompatibility

Another severe headache plaguing IBM software users is the widespread incompatibility of major functional components. In some cases, Hogan explained, interfaces between functional components are inconsistent; in other

cases, nonexistent.

To make matters worse, users often find themselves unable to put all their required software modules together in one processor or select the right programming product from among the dozens of possible IBM options, Hogan said.

The seminar will be repeated in New York March 25-26. The Yankee Group is at 21 Merchants Row, Boston, Mass. 02109.



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Olympic System Tallies Scores in Record Time

By Jeffrey Beeler

CW West Coast Bureau

LAKE PLACID, N.Y. — U.S. skater Eric Heiden won his third consecutive gold medal at the XIII Winter Olympics Games here last week by setting a new world record in the 1,000-meter speed-skating competition. But swift as Heiden's pace was, it proved no match for the speed of the system that recorded his winning time.

No sooner had Heiden crossed the finish line in the 1,000-meter event than an Olympic scorer keyed his official time into a nearby terminal and transmitted the result to two 608K-byte minicomputers at the Lake Placid Olympic Organizing Committee's headquarters.

From there, the information was relayed to other on-line terminals at Olympic Village, site of the Olympic athletes' temporary living quarters, and at the nearby press center, which accommodated about 2,000 visiting sportswriters from around the world. Within moments, news of the American skater's medal-winning performance was being displayed electronically at key points throughout the sprawling Olympic complex and was rushing faster than a speeding Heiden to wire-service nerve centers in New York City.

How were the results of the 1,000-meter speed-skating competition conveyed to the waiting world so

rapidly? Part of the credit for the feat reportedly goes to a distributed record-keeping system from Texas Instruments, Inc. known as the System for Computerized Olympic Results and Events (TI-Score).

Built entirely around TI hardware, the system allowed scorers at the Olympic speed-skating track to send the results of each competitor's performance almost instantaneously to dual DS 990/10 minicomputers at the organizing committee's main administrative offices here.

Once received by the TI minis, the competitive results became part of a central data base that terminal operators could tap remotely to find out each skater's current standing in an ongoing event. The data base also gave speed-skating scorers access to information like the results of previous events and background facts about each competitor, a TI spokesman said.

Major Participant

But TI-Score's applications were not limited just to speed-skating events. The system also gathered data and performed general score-keeping functions for the slalom, giant slalom and downhill skiing races at Whiteface Mountain, nine miles from here; for the 70-meter and 90-meter ski jumps at Intervale, 10 miles away; for the bobsled, cross-country skiing, biathlon and luge runs at Mt. Hoevenberg,

15 miles away; and for figure-skating events on the other side of town.

In short, the system automated the data collection and score reporting for almost every major event during the two-week competition.

In addition to the dual DS 990/10s, the system incorporated assorted TI terminals, including the Model 771, an intelligent unit; the models 745 and 765, both portable units; and the Omni models 810 and 820, receive-only and keyboard send-receive units, respectively. Together, the terminals served as nodes in a distributed score-keeping network that linked the three remote competition sites — Whiteface Mountain, Intervale and Mt. Hoevenberg — by telephone lines to the host DS 990/10s. Data was transmitted at both 1,200 and 2,400 bit/sec.

Management Duties

In addition to its regular score-keeping chores, the system reportedly performed various management duties, including:

- Making housing reservations for about 2,000 athletes and coaches.
- Supervising registration and accreditation of athletes, coaches, sportswriters and sponsors.
- Supplying both major wire services with summary and detailed reports describing the ongoing competitions.

Starting Salaries Up 10%

(Continued from Page 1)

DP starting salaries on the whole increased 8.1% over 1979 figures, Half's annual survey found. It was based on an analysis of position requests received by the agency's 65 U.S. offices and not on a random sample of salaries presently being paid in DP installations.

Among the survey's other findings:

- Small and medium-size companies provide more rapid advancement for employees.
- Large firms usually pay higher starting salaries than small and medium-size companies.
- Small and medium-size installations requiring employees to have experience from large firms must pay salaries competitive with those paid by large firms.

Examining salaries regardless of installation size, Half found that a DP director can expect to earn an average starting salary of \$32,800 this year. A systems analyst manager will start at an average \$27,000 and a systems analyst at \$23,000.

A lead programmer can expect \$19,500 on the average and a programmer analyst can expect \$19,830 to start.

Geographical Differences

DPers working in the Southeast, Southwest and Rocky Mountain regions can expect to start at salaries substantially lower than the national average, according to the survey. States such as Florida, Mississippi, New Mexico and Montana appeared to be as much as 10% below the national norm.

States in the Far West Region of the U.S. showed the highest percentage increases in 1980 starting salaries, followed by the Great Lakes Region. The Midwest showed starting salaries the same or slightly higher than the country's average.

Starting salaries in the Plains States are slightly below the national average, as are those in certain New England states.

Massachusetts and Connecticut were the exception; there, starting salaries are 3% and 5%, respectively, above the average.

Salaries by Site Size

The study showed that a systems analyst in a large installation can expect a starting salary ranging from \$22,000 to \$28,000, an 8.7% increase from 1979. An analyst in a medium-

size installation may earn between \$21,000 and \$25,000, a 10.7% increase; a systems analyst at a small site will start between \$19,000 and \$23,500, a 10.4% increase from the year-ago wages.

Other results showed that a programmer with up to one year's experience will start at a large installation at \$14,500 to \$17,500 on the average, a 10.3% change. In a medium-size installation, a beginning programmer may earn \$14,500 to \$16,000, a 10.9% increase; and a new programmer at a small site can earn \$12,000 to \$15,000, an 8% gain from 1979.

A programmer/analyst working in a large installation can start at \$18,500 to \$24,000, a 6.3% rise over the salaries being offered to new recruits last year. In a medium-size installation, a programmer/analyst can expect to start at \$18,000 to \$24,000 for a 7.7% increase over 1979.

Percentage gains in smaller sites kept up with larger installations. At small sites, programmer/analysts can expect to start at \$15,000 to \$19,500, a 9.5% increase.

Programmer Paychecks

A lead programmer in a large installation can start at \$21,500 to \$26,000, up 8% from 1979 figures, according to the survey. In medium-sized installations, gains were a more modest 3.7%. Starting salaries for lead programmers there were found to range from \$19,000 to \$23,000.

Lead programmers were found only infrequently at small sites.

A systems programmer in a large installation can command an annual starting salary ranging between \$22,500 and \$28,000, a 9.8% increase from 1979, according to Half. In a medium-size installation, a systems programmer can start at \$21,000 to \$25,500, up 8.1%.

Again, the position was not filled in the small installation category, the survey indicated.

DP Directors

The DP director of a large installation can expect to earn between \$33,000 and \$50,000 as a starting salary, representing a hefty 12.1% rise in this category's pay scale. The salary for DP director of a medium-size installation can range from \$28,000 to \$35,000, up 8.6%.

DP managers at small installations can start at \$22,000 to \$29,000, an 8.5% rise.

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In Four Competitions Olympic Scoring System Braves Power Failures

By Tim Scannell
CW Staff

LAKE PLACID, N.Y. — Frequent power failures here at the XIII Winter Olympic Games created a few problems for Texas Instruments, Inc.'s minicomputer-based scoring system, while a general scarcity of snow sent TI personnel scurrying to make a number of last-minute programming changes.

At press time, at least four different events were plagued by power drops or fluctuations during this year's games. The power losses occurred at the bobsled, luge, cross-country skiing and biathlon competitions, forcing TI 771 intelligent terminals at the sites to rely on back-up generators for power.

"In each instance, power was lost for about 10 minutes. [However,] none of the scoring information was lost or garbled during the outages," according to Wayne Winkelman, a TI project manager at the games.

"Power has really been relatively stable. However, it's been a concern we've had because of the massive amount of new equipment that has moved in here," he commented.

Program Changes

Meanwhile, in all but a few of the events, TI's computer team had to reprogram its System for Computerized Olympic Results and Events (TI-Score) to adjust for a lack of natural snow in some areas and keep up with

eleventh-hour registration changes and additions.

Specifically, programs were changed to accommodate new race routes, intermediate distances and timing checkpoints. Some changes were made the day before an event was scheduled to take place.

In at least one competition, the program changes were inserted after the event had occurred and a winner declared, Winkelman said.

One leg of the cross-country skiing event, for example, was run over a slightly altered and more snow-packed course, but with the old and unchanged intermediate checkpoints. Therefore, while the competitors' times were correct at the race's end, the distance they had traveled was not, Winkelman stated.

"I don't think anybody from the press ever recognized that the intermediate times didn't really match up with the distances because we did have the correct winners."

Some time after the race, TI workers inserted the new distances into the scoring program and submitted a second, official report that was subsequently signed by the Olympic Jury.

Other changes were made in the scoring program to cover the increased number of unofficial skiers who were recruited as forerunners to test various runs and to handle any countries that may have registered late.

None of the software alterations were



Winter Olympic sports results were processed at this site on a minicomputer-based scoring system.

major, Winkelman said, noting that TI expected something like this to happen and had a battle plan ready. But, "anytime you're making programming changes to your source [code] the night before one of the most important races in the world... it's a pretty risky thing."

All of the changes were made through a development program that was operating on TI's host 990/10 minicomputer. Programmers edited

the source program at the host, inserted the changes, recompiled the entire scoring program and then downloaded the new instructions to the intelligent terminals. Everything was done on-line without interrupting the scoring of other events during the games.

TI personnel are scheduled to pack up all of their computer gear on two trucks and begin their trek back to Houston tomorrow.

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DP Outlays Forecast for '80

(Continued from Page 1)

tual growth turned out to be 16% last year.

While staff-related and hardware expenditures continue to take up the largest share of the DP budget, dollar-for-dollar spending for software and services represents the fastest growing segment of the budget.

While externally purchased software and services account for only 6.4% of DPers' total budgets, actual dollars expended are expected to climb 27% from \$2.7 billion last year to \$3.4 billion.

Except for time-sharing and remote job entry services, which will exhibit slow growth, spending for software packages is expected to reach \$1.68 billion in 1980, a 31% increase from \$1.28 billion. Likewise, custom software and consulting expenditures are projected to grow 27% from last year's level, reaching nearly \$1.4 billion.

And data entry and computer output microfilm services will rise 25% this year, hitting \$260 million, IDC forecast.

Software and services purchased outside the DP operation will be procured just about evenly from hardware vendors and independent software suppliers, IDC predicted.

However, the \$3.4 billion spent on outside software and services represents only 17% of users' total software expenditures, with the remaining 83% of software-related activity performed by in-house personnel.

Other than software and services, spending for communications will show the largest dollar growth during

1980, according to IDC. This year users will spend about \$1.8 billion for communications, a 20% increase from last year's expenditures.

However, communications still represents a minuscule 3.4% of total user spending, up from 3.2% last year.

For larger users, 35% of communications expenditures are allocated to terminals, 22% to private lines, 19% to dial-up lines, 13% to interconnect equipment, 10% to Wats lines and 1% to satellite services, IDC estimated.

The statistics used in the budget survey were compiled from 200 user responses, segmented by budget size and cross-checked with known industry parameters, IDC said.

Users Voice Concerns

WALTHAM, Mass. — What are the major concerns of DPers at the dawn of the 1980s?

"Improved productivity" of their operations ranks No. 1 among the concerns of the 200 computer users subjected to an in-depth scrutiny by International Data Corp. (IDC) in compiling user spending statistics for the coming year.

Next in order of concern come the problems associated with maximizing the effectiveness of distributed or decentralized data processing operations, IDC said, followed closely by "coping with office automation," which may be interrelated as

DP and office gear get tied closer together in decentralized networks.

Two hardware areas follow as user concerns. First, users are worried about keeping up with all of the new products in the field and the proliferation of equipment choices, IDC said. Second, users are concerned about the best ways to manage their DP investment.

The final area of concern is a perennial problem — "finding, training and keeping good staff" — that is sure to continue into the 1980s as the shortage of qualified personnel grows.

IBM Delays Delivery of Operating System

(Continued from Page 1)

Users scheduled to receive 8100 CPUs before DMS/DPPX is released will have to choose between not using their machines until the operating system is available or switching to the other operating system available on the 8100 line: the DMS/Distributed Processing Control Executive (DMS/DPCX).

One such user plans to switch to DMS/DPCX as an interim measure. Anticipating a late May release of DPPX/Cobol, the firm's DP manager feels he is getting somewhat of a bonus — a free month's rent — since he is unable to use his system the way he ordered it.

The user plans to take the free month to get acquainted with the other 8100 software so he will be familiar with the 8100 system when DMS/DPPX and DPPX/Cobol are finally released.

Although the DPPX/Cobol package has not officially hit the market, it seems to have gained a reputation: One user described it as "a hand grenade waiting to go off." Other users are thinking about what options they will take if the compiler is not released soon.

"We'll use DPPX — if it runs," one user said. Another who is expecting an 8100 delivery in April said, "we anticipate Cobol applications, but we are somewhat stuck as to what our next move is. We really don't know. We don't have an alternative other than maintaining our present system."

Looping Problems

While DPPX may have its problems, DPCX users seem to be faring rather well. Four users whose 8100s were installed with DPCX reported only minor problems.

Three said they are having problems with IBM's "looping" method of attaching I/O devices to the 8100 processor. The early support user suggested those problems may be a result of the do-it-yourself nature of looping. He said users are required to attach

their own I/O devices via the looping connections — they often hook up the wires in the wrong order, he said.

All three DPCX users agreed with that assessment, adding the looping problems are minor. A fourth DPCX user did not plan to use the looping connections.

DPCX users say they are generally pleased with the 8100, but none was able to give an extensive evaluation of his system. The longest time a machine was installed was about a month, while the other three were installed in the past two weeks.

Other users contacted got a bit weary of waiting for the 8100 CPU. A West Coast paper products manufacturer canceled its order for 20 8100 systems. The firm's DP manager said the company decided the CPUs just would not work out in paper mills. The company decided to stick with a manual system.

A Midwest transportation company decided IBM's 4331 processor was a better deal, so it canceled its 8100 order and put in an order for a 4331.

A Wisconsin wholesaler canceled its 8100 order several months ago "because we just couldn't get them when we needed them." The firm ordered a Honeywell, Inc. Level 6 CPU.

Two other users said their 8100 delivery dates were so far out in 1981, they have not given it much thought.

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County Switches Printers

(Continued from Page 1)

hardware-selection committee composed of the county's purchasing agent, several of its DP staff members and representatives of key user departments. No outside consultants participated in the hardware selection.

After defining its product specifications, the committee prepared a formal request for proposal and asked most of the U.S.'s leading printer manufacturers to submit contract bids. Five of the vendors, including IBM and Memorex Corp.'s Communications Group, responded to the county's request.

Memorex Wins Contract

Selection-committee members then scrutinized each of the five bids. After about two weeks of evaluation and comparison, they informed Memorex that its Model 2089 printer had won the contract. Memorex had quoted a price about 20% lower than its nearest competitor, according to Fred Sager, the county's assistant DP director.

The first of the 2089s arrived at the county's computing center here in July 1977, and during the next seven months the total number of units installed grew to 36. By January 1978, all the center's IBM 3286s had given way to their Memorex counterparts.

One year later, county officials are still convinced they made the right printer choice. In addition to costing about 15% less than the IBM models they replaced, the 2089s produce less noise and are more attractively packaged than the 3286s, Sager said.

The 2089s also prove preferable to the IBM printers in their convenience features, the assistant DP director added. For example, the Memorex units reportedly cause less skewing and are easier to load with paper than are the 3286s.

Linked to a 4M-byte IBM 3031 with an MVS operating system, the 2089s provide output for nearly all the major user departments served by the county government's DP staff.

Prompted by Worker Complaints

Niosh Probing CRT-Related Health Concerns

By Ann Dooley
CW Staff

SAN FRANCISCO — Concerns over possible health hazards caused by the increasing use of CRT terminals in the work place have prompted the National Institute for Occupational Safety and Health (Niosh) to undertake another study of CRT-related worker complaints.

Conducted at the *San Francisco Chronicle and Examiner*, the *Oakland Tribune* and the *San Francisco Bay Area's Blue Cross* offices, the results of the Niosh study will not be completed for several months. Believed to be the most comprehensive data analysis yet conducted, the study will also examine a larger number of CRTs than has been done before.

Fears of automation, combined with the threat of radiation damage or physical discomfort, have caused employees to regard the introduction of CRTs with increased apprehension. Although evidence collected so far has shown most fears to be groundless, many employee groups argue that existing studies lack credibility and that safety standards are arbitrary.

The Niosh study is intended to provide definitive information on the dangers of radiation as well as such problems as eye strain, back and neck pain, headaches, loss of visual acuity, dizziness and nausea, problems with eyeglasses and contact lenses and additional stress, reportedly associated with prolonged CRT use.

Union Requests

The Niosh study is being undertaken at the request of five international unions: the Communication Workers of America, The Newspaper Guild, Office and Professional Employees International Union, Graphic Arts International Union and Transport Workers Union of America. In addition, 19 local unions and two regional councils have voiced their support.

The unions contend they need answers to questions such as the length and frequency of rest breaks, lighting, keyboard and screen angle, glare control and the advisability of periodic eye examinations.

The completed Niosh study will consist of a walk-through investigation and a questionnaire given to CRT users and a control group. The ergonomics and physical effects investigation will include measurements of lighting, relationships between operator and desks, chairs, walls, windows, equipment, corrective lenses and more.

CRT Environment

A major problem expressed by employee groups is that employers do not take ergonomic factors into consideration when installing CRTs. For example, work cannot be done at CRTs in the environment previously used for typewriters, many groups claim.

Typewriters, many groups claim. Proper lighting in the work place can reduce glare. Moreover, contrast glare, such as white walls against a dark CRT screen, should be avoided. Screen and character size should be large enough to be read easily and machines should be regularly maintained, at

least twice a year.

As for work schedules, other groups suggest that CRT users should take rest breaks for 10 to 15 minutes every hour and that operators should work no more than two hours at the machine at a time. Employees could also alternate one hour working on the machine and one hour doing another kind of work.

One study has noted that if an operator thinks the CRT will cause problems, it usually does. Surveys have shown that operators do not fully associate with their new work or their new work area and think of it as a temporary situation, even when it is not.

Although the health problems are

real, training and gaining acceptance of the CRTs might end many of the problems created by stress or fear of the machine.

Recent Action

Recent activities and groups involved in the CRT problem include:

- An Information on Health Protection Conference in New York, which drew 350 people. Sponsored by the New York Committee for Occupational Safety and Health, the meeting discussed what operators can do to cope with problems caused by the machines.

- Concerned employees at *The Boston Globe*, where CRTs were installed

about a year ago. However, subsequent changes in lighting and screens ended most of the complaints, according to John White, head of the Globe's Employees Union.

- The Newspaper Guild. The union has drawn up a model contract, which all of its affiliates use in negotiations. It suggests abiding by the laws regulating the machines; regular monitoring and inspection of CRTs to check for radiation emission and general working condition; periodic medical examinations for employees; and regular work breaks for employees engaging in prolonged use of the CRTs.

- Various studies conducted at the

(Continued on Page 10)

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FCC Researching MTS, Wats Sharing, Resale

By Phil Hirsch

CW Washington Bureau

WASHINGTON, D.C. — The Federal Communications Commission (FCC) has initiated an inquiry aimed at determining whether AT&T should be forced to let its customers share and resell the company's Message Toll Service (MTS) — long distance — and Wide-Area Telephone Services (Wats).

The results of the inquiry could reduce costs significantly for smaller volume data communications users. Wats presently provides a cheap way of communicating with remote terminals, but only for those who make heavy use of intercity circuits.

Specialized common carriers and their customers would be the major

beneficiaries if the FCC inquiry, formally known as Docket No. 80-54, erases the present restrictions on the resale of Wats. The specialized carriers would then be able to use Wats facilities to extend their present networks to additional cities; they presently have to use leased lines, which are much more expensive.

The specialized carriers are already offering a number of "metered private line" services which compete directly with Wats and to some extent with MTS. One example is MCI Telecommunications Corp.'s Execunet offering. Others are Sprint, marketed by Southern Pacific Communications, Inc. and City Call, offered by U.S. Transmission Systems Inc., an ITT subsidiary.

If these networks are enlarged, the specialized carriers will be in a position to take business from the telephone company and weaken the underpinnings of Bell's communications monopoly.

The specialized carriers insist that the lower rates enjoyed by present Wats users are unfair, basically because AT&T has never shown that the costs of providing the service are actually lower than those generated by MTS. As MCI put it last summer in a petition to the FCC "The prices AT&T charges for its bulk price Wats service bear little relationship to the costs of providing [it] and constitute an unjust and predatory discrimination against users of MTS, which the commission has found to be a like communications

service."

The MCI's basic point was that if Wats is not functionally different from MTS and imposes equivalent costs on the telephone company, then the Wats rate discounts cannot be justified.

But the other side of this argument is that if a substantial number of MTS users migrate to Wats, AT&T probably would raise the latter rates or do away with Wats altogether.

These possibilities explain why many Wats users — primarily large companies — oppose the FCC's resale and sharing inquiry. Some have pointed out that after the FCC decided in 1976 to allow the resale and sharing of private-line facilities (in Docket 20097), AT&T stopped marketing Telpak which, like Wats, offers discounted rates to users with heavy long-distance communications traffic.

MCI also argued that there is no economic justification for allowing value-added carriers like GTE Telenet to Communications Corp. to resell the service while barring specialized carriers from doing likewise. "The only real distinction between a... value-added carrier... and a specialized common carrier such as MCI is that the former, because it leases rather than builds communications capacity, does not pose as great a competitive threat to AT & T," MCI told the FCC.

Burden of Proof

In announcing the inquiry earlier this month, the commission said that the burden of proof is "with the carriers and... other parties seeking to retain these restrictions" because "resale and shared use of AT&T's public message services provide the opportunity to open up yet another segment of the telecommunications industry to new entrants. It also provides the opportunity for market operations, rather than discretionary authority on the part of a single firm, to determine the utilization of telecommunications resources."

Questions to be addressed by inquiry participants include the following:

- How might the lifting of resale and shared-use restrictions affect rates and rate structures?
 - Would the economies accruing to Wats users be lost if the resale and shared-use restrictions were removed?
 - Would it be advisable to lift the restrictions on an experimental, temporary basis to see what happens?
 - Is it practical to lift resale and shared-use restrictions on Wats while retaining MTS resale restrictions?
- Comments are due May 15 and replies by July 1.

Niosh Studies CRT Concerns

(Continued from Page 9)

New York Times, including one begun after two copy editors contracted bilateral cataracts [CW, Aug. 1, 1977].

- A United Nations study, which showed that radiation emissions were below U.S. standards. Some UN operators are reportedly still refusing to use the machines, however.

- An additional Niosh-financed study on a wide range of CRT-related ergonomic problems, to be conducted at the University of Wisconsin-Madison.

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Linked With Invasion of Afghanistan

Soviet Military Use of U.S. Computers Reported

By a CW Staff Writer

PARK RIDGE, Ill. — The Soviets have diverted U.S. computer systems to military purposes, and there are links between Russia's use of U.S. computers and its incursion into Afghanistan, according to the February issue of *Data Management* (DM) magazine.

Published monthly by the Data Processing Management Association here, DM made the allegations in the first article in a series on computers and international trade.

While calling direct linkage between U.S. computers and the Afghan incursion "weak," DM editor Bill Zalud recounted recent media reports claiming that the Soviet Kama River Truck factory's IBM System/7 and 370/158 computers are being used for military purposes [CW, Jan. 28].

Allocation Reports

In recent Senate hearings on President Carter's embargo on selling U.S. computers and parts to Russia, Dr. Maurice Mountain, director of the Department of Defense Office of Strategic Technology, revealed that part of the contractual agreement IBM has with the Soviets and the Department of Commerce calls for the Soviets to supply printouts showing computer time utilization.

However, "there is always the possibility of overcoming any safeguard... given time, given skill, given incentive... every system can be beaten," Zalud quoted Mountain as saying.

In fact, in late January, the former deputy head of the Commerce Department's Office of Export Administration, Lawrence J. Brady, "resigned his post and bitterly declared that Commerce and Defense did indeed know months before that the Kama River computer was being diverted, at least in part, for military uses," Zalud reported.

"What is important here," Zalud wrote, "is that if Brady's statement is factual... [then] because of political reasons, the Carter Administration chose not to take action against the Soviets until evidence was made public."

Furthermore, "all officials questioned... felt that if spare parts [to Kama River Truck] are stopped," Zalud wrote, "an anticipated Soviet response would be the cutting off of the computer allocation reports."

"Thus, the Soviets would be free to divert use of the computer to military uses without any U.S. policing — a Kremlin 'Catch 22,'" he concluded.

"Illegal" Diversions

Besides the Kama River Truck system, IBM 360s and 370s sold to the So-

viets for educational and industrial uses "may have been illegally diverted to military uses and could well be the cornerstone of the computer system that directs Warsaw Pact air defenses," Zalud wrote, attributing the theory to Dr. Jack Varona of the Defense Intelligence Agency.

Furthermore, regarding two IBM 370/148s sold to the Soviets for support of the 1980 summer Olympic games [CW, Jan. 28], they are "already being used illegally and directly on the Soviet Backfire bomber project by improving its action radius," Lubosh G. Hale, dean of students at the University of Chicago Graduate School of Business, was quoted as saying.

Discriminatory Policy

Zalud described "the deteriorating U.S. world competitive picture," as a result of the allegedly diminishing U.S. technological lead time world-wide, and presented several viewpoints suggesting that the embargo would not hurt the Soviets and could only hurt U.S. computer suppliers.

"We are giving this business on a silver tray to our overseas competitors," Data General Corp. spokesman Brad Stroop, charged. "Of course, we will support the President. But in order for this embargo to work, we will have to hurt the other party and so far there is

no hurt.

"We end up with nothing more than a discriminatory trade policy against our own [computer] companies," the article quoted Stroop as saying.

Other U.S. computer manufacturers interviewed for the article, however, maintained the embargo's impact on them would be minimal because of the small amount of business they do with the Soviet Union.

IBM, Control Data Corp., Honeywell, Inc., Digital Equipment Corp. and Burroughs Corp. agreed they would not be greatly affected. Univac, on the other hand, has \$5.4 million in Soviet orders awaiting U.S. approval or licensing for shipment, according to a company spokesman.

Transfer of Ideas

Even if the embargo is adhered to by U.S. companies, according to a proponent of U.S.-Soviet trade, there are other routes through which the technology can reach the USSR.

"Transshipping" — a phenomenon whereby goods shipped to Portugal, for example, eventually end up in Russia after crossing friendly and unfriendly borders — can cause a loophole in embargo policy, according to Dr. Robert Weigand, professor of marketing at the University of Illinois.

"The point is that ideas travel, no matter. They're going to get out," Marshall I. Goldman, associate director of the Russian Research Center at Harvard University, concurred.

"I think you're being unrealistic if you want to hold onto technology," he added, "though I don't mean to say we should give [the Soviets] all our secrets."

Pacific Telephone To Unplug 7074

(Continued from Page 11)

Telephone's 7074's. A "fantastic" growth rate in its computing work load has forced the company to redesign its billing applications and begin a massive upgrade of its facilities, the hardware support manager said.

Killing Blow

The modernization plan promises to deal a killing blow to Pacific Telephone's old IBM mainframes. To meet just a fraction of its projected computing needs, the phone company would have to commandeer every 7074 still in existence; and even if it did somehow manage to gather all the surviving machines, it would lack the floor space to house them, Berg explained.

During the next two years, Pacific Telephone will gradually replace its 1960-vintage CPUs with newer 8M-byte IBM 370/168MPs and 8M-byte Amdahl Corp. 470/V8s. The phasing out process has already begun, and by 1982 the last 7074 will roll out the phone company's doors forever.

But the saga of the 7074s ends on an upbeat note. True, at Pacific Telephone, the machine's days may be numbered, but elsewhere the story is different. At a California government installation, a federal computing center and a few other scattered outposts around the U.S., the 7074 continues to hold extinction at bay.

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This is only a small part of the TOSC4 story. For additional information, please contact:

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Is Site Living on Borrowed Time?

Q I've been here 18 months and I'm the senior member of our six-person professional DP staff. I also have the most DP experience — 18 months — and at least as much formal DP training as anybody else — none. I'm now the DP manager.

Our hardware is 15 years old and we have more than 600 operational programs. All of the programs are written in assembler and practically none are documented. Only one person really understands the various systems and after more than 30 years with the company, he resigned.

Top management is breathing down our necks to implement several major new systems and to make significant changes to existing systems. Also, we received a whopping 3% budget increase for next year (lowest of any department).

Any ideas as to where to start?

A If I had not seen a very similar environment in the recent past, I would have thought your letter to be a practical joke.

You are living on borrowed time. The situation that you've described indicates that DP has been almost totally neglected and that corporate management is flirting with disaster. Is it aware of this?

The problems are too numerous and complex to be addressed in this limited space. Seek out and retain a competent consultant who can not only evaluate all phases of your operation, but recommend solutions. If top management refuses to fund an outside consultant or, worse yet, does not recognize the need for assistance, then I would bring my resume up to date if I were you.

Q My boss consistently commits the department to deadlines which are nearly impossible to meet. The result is a mediocre job performed in a crisis atmosphere. Furthermore, the lack of documentation makes maintenance a nightmare. What can be done?

A The resultant system not withstanding, your boss is making three critical errors (among others). First, the product of his overcommitment is a system that is probably less than the user wants. Second, people must be able to take pride in their work in order to realize any kind of job satisfaction; your boss has denied you this opportunity. Third, no system is truly implemented until the documentation is completed.

Hastily developed systems inevitably result in high maintenance costs. The best investment a company can make is to put enough money and time into a systems project to do it right the first time.

It is probably too much to ask that your boss recognize the shortcomings of his approach to systems development. After all, he is meeting his commitments.

However, sooner or later your boss and the company must pay the piper. I only hope he reevaluates his approach before you and your colleagues are totally committed to systems maintenance and nobody is available for systems development. If he doesn't, he may have no resources to commit.

Q We have an operational computer system that was written 12 years ago in a language nobody

has been updated. Not one programmer in the computer center knows this language and nobody wants to learn. The computer drives our internal

'Turnaround Time' is a new reader service column that will appear regularly in *Computerworld*. All kinds of questions are invited, but readers are urged to keep them as concise as possible. Send them to Larry Long, Editorial Department, *Computerworld*, 375 Cochituate Road, Rt. 30, Framingham, Mass. 01701.

uses anymore. We have not updated our system for the last three years. We get error messages when entering the addressee because several buildings have been built since the building table

procedures, not us. How did we get in this fix?

A I would be more worried about how to get out of the fix.

Turnaround Time

By Larry E. Long



Every computer-based information system has a life cycle which starts with birth, followed by development, implementation, operation and, finally, death. Your system is probably dead.

I would recommend making a formal request through the proper channels for a feasibility study to investigate alternative approaches to replace — not enhance — the existing system.

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Vendor Left DP, But User Can't Cancel Pact

OTTAWA — Falling out of love with your mainframe vendor just because it decided to leave the computer business isn't a good enough reason to get out

of a contract with it.

That was the ruling of the Ontario Supreme Court recently as a Canadian publisher tried to back out of a deal

with Singer Co. of Canada when Singer announced it was going out of the computer business, according to a report published in the "Computer Law and Tax Report."

Clarke Irwin & Co., Ltd. liked Singer's System 10 back in May 1975, when it signed a contract for a 40K-byte system. It was installed that August, and the firm liked the CPU so much that it began to think of expanding it.

However, when Singer announced the following December that it was going out of the computer business, Clarke Irwin suddenly decided it no longer wanted the Singer system and stopped further expansion work, according to the newsletter.

In the beginning of 1976, Clarke

Irwin stopped using the machine. Singer made arrangements with TRW-Systems & Services to handle maintenance on Singer systems; the firm promised Clarke Irwin that TRW would maintain its system for the next five years, but the firm was not impressed.

According to Clarke Irwin, "Singer disappeared from the computer business and hence its support for the equipment could no longer be relied on," the newsletter reported.

Although the Ontario Supreme Court noted Clarke Irwin's approach was a novel one, it ruled last December that its argument was insufficient. Clarke Irwin must continue with its Singer System 10 regardless of whether it has lost faith in Singer.

The monthly newsletter is published from 100 Tower Office Park, Woburn, Mass. 01801.



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CW-233

Call for Papers

CONVENTION INFORMATIQUE, Paris, Sept. 15-19.

The central theme of this international software congress will be data processing and information. Papers should highlight the role of DP in decision making and management processes, concentrating on analysis of information, data retrieval, operating software, data bases and communications.

Case studies are required illustrating DP in administration, banks, insurance, health, transport, services, trade and retailing, agriculture, small and medium-size companies, construction, local government and industry.

Deadline for all submissions is Feb. 29. Application forms are available from Jeanne Poyen, Delegation Permanent, Convention Informatique, 6 Place de Valois, 75001 Paris, France.

SIXTH INTERNATIONAL CONFERENCE ON VERY LARGE DATA BASES, Montreal, Oct. 1-3.

Papers are sought on topics which include but are not limited to data base design, implementation, interfaces, data model theory, distributed data bases and office systems.

Papers should be in English, up to 5,000 words; abstracts up to 100 words are encouraged in a language of the author's choice. Extended abstracts (two pages) are also being solicited for panel, survey and tutorial sessions.

Five copies of each full paper, abstract and extended abstract should be sent by March 10 to either Dr. Robert W. Taylor, IBM Research Laboratory, K53/282, 5600 Cottle Road, San Jose, Calif. 95193 or Prof. Frederick H. Lochovsky, Computer Systems Research Group, 121 St. Joseph St., University of Toronto, Toronto, Ont. M5S 1A1, Canada.

THE 1980 CANADIAN CONFERENCE ON COMMUNICATIONS AND POWER, Montreal, Oct. 15-17.

A wide variety of topics will be covered with an emphasis on the impact of technology on the environment; fiber optics from both the telecommunications and power perspectives; simulation and optimization techniques applied to flow control or architectural aspects of either power or telecommunication networks; image and speech processing techniques and applications; and the impact of microprocessors and distributed intelligence.

Authors are requested to submit five copies of both a 500-word summary of a proposed 15-minute paper in English or French and a brief biographical note by March to Yvon Garvais, Chairman, Technical Program Committee, Ecole Polytechnique, CP/PO Box 6079, Succ. "A", Montreal, Canada H3C 3A7.

FOURTH ANNUAL DATA ENTRY MANAGEMENT ASSOCIATION (DEMA) CONFERENCE, Orlando, Fla. Nov. 10-14.

Papers are welcome on all topics related to data entry, distributed processing, word processing and human-machine interface.

Submit papers, with a brief autobiographical sketch, to Marilyn S. Bodek, DEMA, P.O. Box 3231, Stamford, Conn. 06905.

Aids DP Security Firm

Employee Motivation Survey Fights DP Crime

By Jay Woodruff

CW Staff

PLYMOUTH, Mich. — A DP security firm here has added what it calls a "definitive" tool to its arsenal of services. It measures employee motivation to determine a company's vulnerability to theft, fraud and embezzlement.

Computer Protection Services, Inc. (Computect) has only been in business about a month, but its owner, Jack Bologna, has spent 30 years in accounting, investigative auditing and management consulting work. His firm performs the usual surveys of physical security, personnel selection, hardware, software, contingency plans and the like.

But the one survey that, according to Bologna, gives Computect the clearest indication of a company's chances of being robbed by its own employees is a motivational survey drawn up by the University of Michigan's Institute for Social Research. While he admits the security business is not an exact science, he does think the survey represents a breakthrough in pinpointing problems that may cause DPs to take advantage of the firm in which they work.

Management Acceptance

Because the survey lays bare a company's motivational tendencies and problems, only the "most progressive management is likely to permit its use," Bologna explained. Moreover, it needs the support of everyone, from top management down, in order to work.

Once a firm can see its own pluses and minuses, it is in a better position to provide the kind of work environment that is less conducive to criminal acts, he explained.

"We're there to develop better internal control, and we need employees' advice as they need ours. There are usually some very bright people interested in the company's security who can point out problems that an outsider would never catch," he explained.

Five-Part Survey

Computect starts off its study by getting an overview of computer security from the firm's DP staff. Then the five-part motivational survey is completed by everyone from upper-level executives to those with the least amount of authority.

The first part measures the respondent's view of the company's organizational climate. Firms that have stood still technologically often breed discontent among employees who think the company is making no commitment to giving them the latest work aids. A shiny new piece of equipment can be a great morale builder, Bologna said.

By getting responses from the entire hierarchy of the organization, Computect can determine how good its flow of communication is, whether or not it gets blocked at any one level and who is not getting regular input on company decisions that will help everyone understand what is needed to do a better job.

"We sometimes find that communication dies in middle management —

what we call the Van Allen Belt Syndrome of miscommunication," he added.

The final part of the organizational climate section of the survey determines what influence, if any, lower level employees have in the system. "People need to feel they are part of the organization. They have to make some decisions," Bologna observed.

The leadership section measures such things as managerial support: Does management provide the help needed to get through a problem? Is everyone aware of the company's "game plan"? If so, how is each employee expected to contribute to it? The survey also asks if management has the resources

it needs to get its work done.

A group process section essentially measures how the parts of the organization fit together and what, if any, rough edges need to be brought to light and corrected. A fourth section on job characteristics asks the respondent to describe the degree of challenge in the job, task variety, autonomy and identity — are you important to the company?

Finally, the questionnaire asks about satisfaction, which is measured by pay, benefits, satisfaction with superiors, chances for meeting future goals in the company and other indicators.

Meanwhile, Computect is busy conducting a full schedule of surveys to

determine the firm's level of risk and vulnerability from physical and climatic hazards, the adequacy of information protection measures, access and authorization controls and personnel policies.

But this "classical" method of data security investigation "doesn't mean anything if the employee walks off with the till the next morning," and that is what the survey results can help a company prevent, Bologna claimed.

The surveys are scored at the University of Michigan, where they are compared against 30,000 completed surveys, including a small but growing DP category.

While you're waiting, Wang's VS could be working.

If you're waiting for an IBM System 34 or 38, you've got a lot of time on your hands. So why not take a few minutes and closely consider just what you'll be getting a year or two down the road. Most importantly, consider your options.

Options like Wang's VS virtual storage computer, for instance. Compare the Wang VS and the System 34/38. We think you'll find the VS consistently comes out on top. The VS will accept your RPG programs just like a System 3, with RPG II and CCP conversion aids available to protect your System 3 software

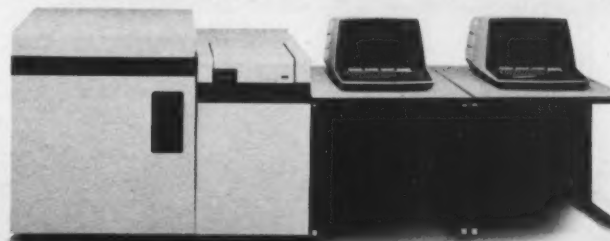
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power of a high-end 370, without reprogramming or major equipment swap-outs. Plus the ability to do data processing and word processing at the same Wang terminal. All this now, for no more than you'll pay for a System 34 or 38 next year.

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OCR Scanner Stores Corrections School Processes 24,000 Class Schedules in Day

By Jay Woodruff

CW Staff

COLLEGE PARK, Md. — A large university here has cut the time needed to process 24,000 student class schedules from two or three weeks to less than a day.

The University of Maryland's Computer Services Group is still working to correct software-related problems with its Scan-Data Corp. 2250 optical character recognition (OCR) scanner, delivered just prior to class preregistration last fall. Despite some unfavorable publicity surrounding its first run, however, the use of the Scan-Data unit still resulted in fewer errors than the previous OCR system.

The university had been using a Cognitronics Corp. D112 OCR system for nearly eight years, but found that parts were hard to get and scanning speed was too slow. After entertaining competitive bids for a replacement, it ordered the Scan-Data system.

The Cognitronics system was designed to stop each time it encountered an unreadable character then restart only after an operator looked at the handwritten schedule to determine the correct character.

The Scan-Data equipment identifies unreadable characters and stores them for on-line correction by CRT terminal operators. The bulk of the schedules can be processed rapidly and corrected

later, according to Robert Roberson, director of Administrative Computer Services.

Processing formerly took nearly three weeks following preregistration for class each fall and spring. This year, 23 operators working primarily on Hazeltine Corp. and Teleray Corp. CRT terminals made the corrections in less than 24 hours, including scanning time, Roberson said.

The Registration Process

The registration process begins each semester when students fill out their preregistration forms. Along with name and Social Security number, the student indicates the course he wants

to take by writing that course's number in a column on the left of the form.

Opposite the priority course, students write in the number of a second choice to be used if the first course is filled when the form is processed. On the average, the student picks a total of 11 courses, including alternates.

The forms are run in 500-card batches on the OCR scanner. The scanner incorporates 8M char. of disk storage and a 16 bit/in. tape drive.

The forms are numbered as they are entered into the data file of a Univac 1108 computer. Of the 25 million handwritten characters entered into the scanning system, about 135,000 cannot be recognized, a decrease from the 175,000 to 195,000 unreadable characters with the old system, according to Roberson.

To correct the file, the terminal operators call up the 500-card lots by number in the same order in which they were processed. When a form is displayed, any unreadable characters are indicated on the CRT by a slash. The operator refers to the stack of forms and reads the appropriate one to determine what the correct characters should be.

The university is working to iron out the software problems that the school could not foresee before the system was installed. For example, the logic of the software was not prepared to deal with forms that had been incorrectly filled out.

If a student neglected to fill out the left-hand column (course selection) and instead filled out only the right alternate choices the system logic assumed the student had not requested a course. If there was a parity error, "the program defaulted to the next student without processing the previous form" Roberson said. As a result, some students did not get courses they wanted because by the time their forms were processed, those courses were closed.

Aicpa Meeting Set for Michigan

NEW YORK — The American Institute of Certified Public Accountants (Aicpa) will hold its 16th annual Computer Services Conference May 19-22 in Dearborn, Mich., focusing on the current state of computer-based business systems.

Targeted for accountants and auditors, the three-and-a-half-day meeting will consist of sessions ranging from a workshop on structured systems design to a discussion of office automation in the '80s, an Aicpa spokesman explained.

The keynote speaker will be author and lecturer James Martin, who will discuss the distributed processing revolution. Other speakers include Elizabeth Severino, director of new product development for Datapro Research Corp. and Alan Hald of the Arizona-based Phoenix Group, Inc.

Advance registration for the entire conference is \$295. However, the fee for those people registering after March 15 will be \$325.

Additional details on the meeting are available from Aicpa at 1211 Ave. of the Americas, New York, N.Y. 10036.

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Cable TV Net Subs for Phone Company in N.Y.

By Phil Hirsch

CW Washington Bureau

NEW YORK — Cable TV networks have been pondered for a long time as a possible alternative to telephone company-provided local loops, but so far there's only one city in the country — New York — where this option is actually available.

One reason may be New York's heavy concentration of on-line terminals. Another is that New York Telephone provides poorer service and charges more for it than any other Bell operating company, members of the Communications Managers Association (CMA) contended when they were interviewed here at their February meeting.

The meeting's featured speaker was Helaine Ciporen, communications marketing manager of Manhattan Cable TV, Inc., a Time-Life subsidiary which in 1974 began transmitting data experimentally on a 300M bit/sec coaxial cable that runs underneath Broadway between 86 St. and the Wall Street financial district. Last fall, Manhattan Cable decided to make it a permanent service offering.

Benefits for Customers

Manhattan Cable's coaxial cable transmits data at all the common bit rates from 2,400- up to 1.5M bit/sec at prices 5% or more below those charged by New York Tel, according to Ciporen. The saving to the user is far greater, however, because Manhattan's shielded cable is inherently less noisy than typical telephone company local loops, she said.

As a result, Ciporen explained at the meeting, there are fewer errors and higher throughput: "We guarantee an error rate of 1:10⁻⁷ bits transmitted, but the actual rate is typically 1:10⁻¹⁰."

Moreover, it takes only two weeks from the time a service order is placed with Manhattan Cable until the circuit is installed. And since Manhattan Cable uses a single coaxial cable in place of the telephone company's "spaghetti" network of local loop circuits, it takes considerably less time to find and fix an outage, Ciporen said.

There have been few outages, she quickly added. During the five years that Manhattan Cable has been transmitting data, its availability "has averaged 99.8%."

Single Message Path

Another key benefit, she pointed out, is the bandwidth brought to the user's site. It not only enables the user to employ a single message path for all its data communications, with resulting savings in hardware, space and circuit costs, but it also reduces the cost of incremental increases in system capacity.

Manhattan cable charges \$220/mo for a synchronous 2,400 bit/sec circuit and only \$40 more for a similar 4,800 bit/sec facility. For a 19.2K bit/sec channel, the price is \$400/mo; for 56K bit/sec, \$475. Thus, additional capacity can be acquired with a minimum amount of financial pain.

Even more importantly, possibly, is that by spending a little more on its original system, the user can obtain the extra transmission capacity needed to prevent long message queues from developing during peak traffic periods.

While Manhattan Cable's 6cal-loop

(Continued on Page 18)

Customers Confirm Claims

NEW YORK — Two of Manhattan Cable TV, Inc.'s customers — Chase Manhattan Bank and Bankers Trust Co. — confirmed most but not all of the claims made by Communications Marketing Manager Helaine Ciporen at a meeting of the Communications Managers Association here this month (see accompanying story).

Specifically, they said the quality of the circuits provided by New York Telephone is generally as good as that provided by Manhattan Cable, but both customers agreed it takes the telephone company considerably longer to install broadband facilities.

This is particularly true of Digital Data Service (DDS) circuits, according to Chase Manhattan Vice-President Robert Sutherland. Chase Manhattan had to wait four months for one DDS circuit late last year, and others at the meeting reported some customers in Manhattan have had to wait as long as eight months.

Manhattan Cable, by comparison, provides a similar facility in two weeks, Sutherland said.

Both banks reported they are paying Manhattan Cable significantly less than they would have to pay New York Tel for comparable facilities.

Bankers Trust, for example, leases a 50K bit/sec cable circuit from Manhattan Cable and, for backup, a "wide-band 50" (Series 8000) circuit from the telephone company. The latter costs \$400 more each month, even though both have the same capacity.

Trouble calls are answered by Manhattan Cable "within an hour and a half, and its technicians work overtime if necessary to get service restored," said Bob Behensky, a member of the Chase Manhattan telecommunications staff, said. "We have to wait at least a day, and often much longer, for the New York Tel serviceman."

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Other Areas Ripe for Local-Loop Alternatives

By Phil Hirsch

CW Washington Bureau

NEW YORK — Although Manhattan Cable TV, Inc. serves a limited geographical area (see story on Page 17), its coaxial data transmission service suggests what users in other areas might expect if and when similar facilities are installed in their communities. There are a number of signs that, within the next few years, local loops provided by other than the local telephone company may become available in a number of communities:

- U.S. domestic satellite carriers are looking at cable as a possible way of reaching their data communications customers. One big advantage of such a hookup is the extra bandwidth it provides. Another is that the local distribution facilities are not owned by the telephone company.

American Satellite Corp. reportedly

has begun talking to some cable system operators, while Western Union Corp. has asked the Federal Communications Commission to allow the sharing of satellite earth stations. Sharing would reduce the cost of interconnecting with those cable systems that already have earth stations in place. There are more than 2,000 with such facilities.

- Xerox Corp.'s proposed Xerox Telecommunications Network (Xten), an electronic message system, will use a sophisticated, computer-controlled microwave network in place of telephone company-provided local-loop circuits. Xerox also has begun marketing Ethernet, a cable-based "local area network" that provides switched service.

- New cable systems are likely to be installed in several major cities within the next few years — notably Pitts-

burgh, Chicago, Cincinnati, Detroit, Minneapolis and Houston. Until now, most cable TV networks have been built in smaller communities, where the concentration of data communications users is pretty thin.

At least some of the new systems will have two-way transmission capability, and most will have more channels than the bulk of the networks now operating.

- The installed base of on-line terminals — for long-established applica-

tions as well as new ones like word processing, high-speed facsimile and electronic mail — is growing rapidly, and so the potential demand for broadband local loops is also growing in this area. If teleconferencing and digital voice transmission become popular within the next five years, as seems likely, this trend probably will accelerate, since broadband offers cost savings compared with the use of separate message paths for different kinds of digital information.

New Yorkers Using Cable

(Continued from Page 17)

service is more economical than what the telephone company provides and offers other benefits, it also has serious limitations. No switching capability is available, and the cable does not interconnect with Bell's local network nor with any long-haul carrier.

Furthermore, it costs a user \$3,000 to \$5,000 to connect its site to Manhattan Cable's coaxial trunk if the user is in a building that does not have such a link.

None of these are inherent obstacles, though, and some may be eliminated in the near future.

Manhattan Cable is currently negotiating with at least three satellite carriers — American Satellite Corp., RCA Corp. and Satellite Business Systems — for access to their long-haul facilities. By next June, Metropolitan Life Insurance Co. is expected to be using this interconnected cable-satellite message path to link its Manhattan headquarters with a number of distant cities.

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TAMPA, Fla. — As thousands of runners pounded their way to the finishing line in the Gasparilla Distance Classic here, a minicomputer effortlessly recorded the exhausted runners' finishing times and positions.

Donated to the race organizers for the second year in a row, the Honeywell, Inc. Level 6 Model 47 scored and timed the 9.3-mile event held earlier this month.

Honeywell supplied race organizers with hardware, training and expertise to ensure that race results were generated accurately and without problems. Runners' names, addresses, age groups, race numbers and other relevant information were entered into the system prior to the race.

On the day of the race, the system matched all the stored information with each runner's finishing time and position.

This year, bar code readers were incorporated into the scoring and timing system. As runners crossed the finish line and proceeded through the chutes, their numbers were collected by race officials and then scanned by the bar code reader — all within minutes. Shortly afterward, the system generated printouts showing the results.

The bar code readers were first used in the 1979 Bonne Bell National Championship for Women in Boston.

The Poe & Associates Run for Fun & Health, which covers 5,000 meters or 3.1 miles, followed the Gasparilla Distance Classic this year. Both races be-



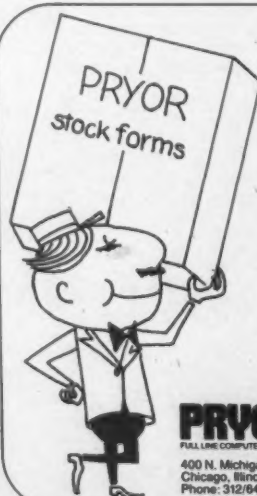
Greg Meyer, a member of the Greater Boston Track Club, crosses the finish line.

gan and ended in downtown Tampa; the Honeywell system timed every runner in the first event and the first 100 finishers in the Run for Fun. More than 9,000 completed the two races.

The system worked "swimmingly," according to race organizers. They also used it to print postcards to be sent to those who completed the race, listing their times and placement.

Greg Meyer won the Gasparilla Distance Classic with a time of 43:40 and Grete Waitz won the race in the women's division with a time of 48:01.

The system used in the race consisted of the Level 6 with 256K words of memory and two 80M-byte mass storage units, six VIP7200 CRT terminals and a 900 line/min printer.



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Service Bureau Maintaining Mail List Fund-Raiser Using Direct Mail to Reelect Carter

By Marguerite Zientara

CW Staff

WASHINGTON, D.C. — "A labor of love" is how President Jimmy Carter's head of direct-mail fund-raising describes her job. "I'm not really that interested in direct mail, to tell you the truth; I'm just interested in doing my little part to help Jimmy Carter get elected."

And with nine Presidential hopefuls trying hard to unseat the chief executive, Deputy Fund-Raising Director Tricia Segall Davis is working 15 to 18 hours a day, seven days a week trying to keep her boss in the White House.

Admittedly, direct mail — represented by \$400,000 of the \$6.7 million raised so far — is just a small part of the effort Davis expends toward raising money for the President. Other techniques include such things as organizing 2,800 home parties through-

out the country last December — a project that netted "thousands of donations," according to Davis.

In addition, those donors were put on computerized donor lists and automatically regarded as possible future contributors as well, she said.

Apart from such social activities, there is the nitty-gritty of political letter writing, including the maintenance of internally developed mailing lists representing a total of about 350,000 names and addresses of past contributors and volunteer workers — and that is where the computer comes in.

Under contract to the Carter-Mondale Presidential Committee, Compac, Inc. of Silver Spring, Md., "puts our

list in ready order for direct-mail use, keeps the list clean for us and runs whatever I have to run," Davis said.

"I really don't know anything about computers outside of what I need to know," she added. "And the reason I like Compac so much is that I can talk in layman terms and [Compac President Jim Burton] talks to me that way instead of getting all technical."

While Burton may not "talk technical," his company has been doing data base management, information retrieval and software management for 12 years.

Compac has a 512-byte IBM 360/50, two IBM 1403 printers at 1,000 line/min and 2.5M bytes of disk storage, as

well as tape reels that hold 90,000 records each.

Two Campaigns

Within Compac's contributor files are separate lists of people who gave money for the 1976 Carter campaign and those who gave in 1979. The data includes a person's name, address, some phone numbers and the dates and amounts of gifts.

While word processing-based "personalization" is at a minimum in this campaign, when used it has been found to be very effective. "We had a definite increase in contribution levels" after a December mailing to

(Continued on Page 20)

Davis Learned At Dees' Knee

By Marguerite Zientara

CW Staff

WASHINGTON, D.C. — The woman who now heads the direct mail fund-raising effort for Jimmy Carter learned the tricks of the trade at the knee of Morris Dees, now the finance chairman for rival Democratic candidate Sen. Edward Kennedy.

Dees, who was Carter's finance chairman in 1976, is a direct mail specialist who ideologically agrees more with Kennedy than Carter, according to Dees' present assistant, John Cohlan.

"I think he always preferred Sen. Kennedy and in fact tried to urge Kennedy to run in 1976," Cohlan said. "So in that sense it's not at all a contradiction and is a natural thing for Morris to do."

Be that as it may, Carter's present deputy fund-raising director, Tricia Segall Davis, is one Carter worker who is not about to change allegiances, judging from her undying dedication to candidate Carter.

"I'm not your typical political hack who goes from campaign to campaign," Davis said. "I'm sure I'll never do another one, at least not to this extent." By "this extent," she means working 15-18 hours a day, seven days a week, even though she is "not really that interested in direct mail."

And while her interest may not run deep, her knowledge does, gleaned as it was from Morris Dees, a man who over the years "has made millions of dollars through direct mail for Democratic candidates," she noted.

After working as Dees' assistant in Carter's campaign, Davis then moved to the Democratic National Committee to run its direct mail fund-raising program, where she stayed until last summer.

Davis' foray into both direct mail and politics came with Jimmy Carter's 1976 campaign and is likely to end with his 1980 reelection effort — win or lose.

After that, she intends to go into the private sector and "probably not" in the area of direct mail.



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Carter Aides Get Kennedy Fund-Raising Letter

By Marguerite Zientara

CW Staff

WASHINGTON, D.C. — While it brings in thousands of dollars, direct mail does have its drawbacks, as witnessed by a fund-raising letter that several top White House aides received from the Kennedy for President Committee soon after Kennedy announced his candidacy last November.

The six-page letter, sent to President Carter's press secretary, Jody Powell, Domestic Adviser Stuart Eizenstat and others asking for a donation of at least \$25, was attributed by the general press to a "computer snafu" but undoubtedly resulted from the overwhelming impersonality of direct mail itself.

While it is possible to "clean" large

mailing lists to eliminate duplicate names, no direct-mail operation would have the time, personnel or money to physically examine each list for particular names.

The letter received at the White House last November reportedly stated the Kennedy Committee wanted the recipients to be among the 100,000 Americans it was trying to enroll. The appeal added it would send a Kennedy Club membership card and pin as soon as a contribution was received.

"My first need is to gain the support across the country from people like you who are especially concerned and aware," the letter, signed by Kennedy, said. "In every city, town and suburb there are always certain people who feel their social responsibilities espe-

cially keenly.

"These are the people who turn on the television news every night, carefully read the important stories in their newspapers and news magazines and leave their comfortable homes to attend civic and political meetings," it continued.

Partner Tom Matthews of Kennedy's

direct-mail contractor, Craver, Matthews & Smith Co., dismissed the incident as "a silly story."

"I don't see any reason why Jody Powell shouldn't get a fund-raising letter from Kennedy," Matthews contended. "That's done all the time — I get all the conservative mail that's printed, and I would think that he would, too."

Direct Mail Being Used To Reelect President Carter

(Continued from Page 19)

some 1976 donors and all 1979 donors, Davis said.

In that mailing — which used a Xerox Corp. 9700 laser printer at a local firm, The Last Word — the staff sent letters citing the prior contribution and asking for another, larger donation. For example, if someone gave \$10 in June, the letter asked for a minimum of \$15; if someone gave \$50, the letter asked for \$100.

"The number of people who respond, percentage-wise, decreases as we mail to the same list several times," Davis observed, "but our average give goes up, therefore we bring in more money."

Presently, the staff is doing a "prospect mailing" of 50 rented mailing lists, sending two different letters "to see which list might work best to bring in some new names," Davis explained.

In a rented list, there is a broad cross-section of people "from conservative to liberal," Davis noted, not to mention Republicans as well as Democrats. "We just choose lists that we think might work well for us."

"If all of the 50 lists — which are mailed in small 'test' quantities — worked tremendously well, we could mail out over a million pieces, if we wanted to spend the money in that area," Davis added.

Within Compac's lists of 350,000 names are about 100,000 contributors

who gave in 1976, about 50,000 volunteers and political workers from 1976 and about 200,000 people who were invited to Carter's inauguration.

Worthy of note is the fact that these people are not all Democrats. "Quite a few Republicans support the President, and quite a few Republicans supported [him as a] candidate in the last campaign," Davis noted. "But I'm sure it's primarily a Democratic list."

With the committee continually sending out fund-raising letters, the list of donors is always increasing. Every month is different in terms of the number of pleas sent out, subject as they are to the political winds of change, Davis observed.

For example, in December about 300,000 pieces went out, while in January only half that number were sent, Davis said. Two weeks ago about 80,000 letters were sent to potential donors, with a planned 130,000 more to go out this month.

While some timely donations are now being solicited from New Englanders in upcoming primary states, political persuasion mailings are the real ammunition in the Northeast.

Since starting last June, the direct-mail fund-raisers have sent out a little over a half-million pieces of mail in all, Davis estimated, including a direct-mail follow-up to a September "phone bank," in which workers telephoned potential donors directly.

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Handicapped Enter Job Market

Nine-Month Project Gives Birth to New DPer

By Tim Scannell

CW Staff

BALTIMORE — To a group of students who recently completed an intensive nine-month programmer training course here, graduation meant a lot more than being able to fill out a coding sheet or juggle a handful of Cobol statements.

The 14 students are the first graduates of a programmer training project designed to give severely handicapped people a marketable skill and put them into the jobstream. Backed by federal and state grants, the course was initiated last year by IBM and is operated by the Maryland Rehabilitation Center and nearby Johns Hopkins University.

Currently, 12 such courses are being run by state rehabilitation agencies around the country; 12 more are planned for the immediate future, according to Bill Montgomery, director of the Maryland training project.

"Computer programming does not require a great deal of physical activity, so it's an ideal profession for the handicapped," Montgomery said, noting that one of his students is a 29-year-old quadriplegic and two are legally blind. In fact, most employers feel that if a disabled person has one to two years' programmer training, he is just as valuable as an employee with no physical handicaps.

Backing up this claim, Montgomery pointed out that although his students have been out of school for a little more than two weeks, six have already found programming jobs.

Although tuition for the 38-week course costs about \$4,000 per person, nearly all of the students attended free of charge since payment is based proportionally on income. The one person who did pay was charged \$50 per month.

Three-Part Course

The course is divided into three instruction modules, each one covering a particular aspect of the DP world. During the first 10 weeks, students are introduced to the basics of computing and shown the various types of computer systems. This part of the course is also sprinkled liberally with DP history and frequently used terminology.

The second part of the course focuses on Cobol, giving students a chance to work out various programming problems on IBM 3033 and 370/158 mainframes located at Johns Hopkins. The two computers are accessed through an IBM System/34 minicomputer used as a communications terminal at the rehabilitation center. The project also has five standard terminals and a key-punch machine.

The final third of the course consists of actual on-the-job training through work-study internships sponsored by businesses in the Baltimore area.

Throughout the course, several guest lecturers are brought in who are handicapped yet have carved out an employment niche in DP. The lecturers not only boost morale, but also demonstrate that the students can shoot for more than textbook success.

As an added incentive, successful graduates are given college credits from Johns Hopkins that can be applied toward an academic degree.

Montgomery was quick to note that

while the project is aimed at the handicapped, the course is not simplified. Aside from a few minor equipment modifications to accommodate physical disabilities, the equipment in the course is the same type a student might encounter in the real world. And the training is just as tough as that offered by conventional vocational schools.

In fact, although 14 students graduated, four dropped out for various social and academic reasons, Montgomery said.

Oversight Committees

To sharpen its competitive edge in the DP job market, the project is overseen by three committees made up of

representatives from IBM, Bethlehem Steel, Blue Cross/Blue Shield and other area companies familiar with employment requirements and prospects. The committees have the final say on what goes on in the classroom and what exactly the students should learn.

A curriculum committee continually reviews and revises course content, keeping up with the state of the art; an evaluation committee examines the scholastic prowess of each student, assuring that trainees have the technical competence of entry-level programmers; and a placement committee prepares each graduate for the job interview, stressing the sometimes tooth-and-nail reality of the employment

race, Montgomery said.

Although the DP profession offers the handicapped comparatively higher starting salaries than other industries — the six Maryland graduates are presently earning between \$11,000 and \$15,000 per year — there still exists a number of occupational roadblocks. The greatest problems by far are access to buildings and physical barriers such as doors and standard elevator controls that might prevent a disabled person from reaching a job.

Fortunately, a lot of companies are beginning to recognize the handicapped workforce and are investing in access ramps, specially constructed doors and lowered machine controls.

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Mainframers Appeal Ruling Dismissing Standards Suit

By Jake Kirchner

CW Washington Bureau
WASHINGTON, D.C. — All four computer mainframers suing the government to block its adoption of four I/O interface standards have now appealed a recent federal judge's decision dismissing their suits.

Burroughs Corp. and Honeywell, Inc. filed appeals of the dismissal ruling in U.S. District Court here Feb. 8. Control Data Corp. and Sperry Corp. had filed appeals earlier [CW, Feb. 11].

Federal Judge John G. Penn ruled Jan. 30 that the four companies did not have "standing" under the Brooks Act of 1965 to block implementation of the standards, which are based on IBM architecture.

The judge accepted government arguments that the court cannot tell federal agencies what types of computer equipment to buy. In filing their suits last October, the four companies said their government business would be damaged while they spent several years and millions of dollars altering their equipment to comply with the standards [CW, Oct. 22, 29].

While the firms would not say on what basis they will argue against the dismissal ruling, a Burroughs spokesman said "the court did not face the substantive issue of whether the standards were properly adopted."

Attorneys for the companies had argued that under the Brooks Act, which calls for efficient and economic acqui-

sition and use of federal DP resources, only the President can promulgate standards and that former Commerce Secretary Juanita Kreps exceeded her

Washington Update

authority in ordering their adoption. The four standards are slated for mandatory governmentwide implementation June 23.

The appeals court for the District of Columbia has not yet scheduled any action on the appeals.

Senate Votes to Bar FTC Rule Making

The U.S. Senate recently voted to prohibit the Federal Trade Commission (FTC) from involving itself in the development of DP standards.

The vote came Feb. 7 when the Senate passed a bill to amend the Federal Trade Commission Act. Besides limiting FTC activities in a number of areas, such as children's television advertising, the Senate voted 70 to 28 to retain a section of the bill calling on the commission to discontinue its Proposed Trade Regulation on Standards and Certification.

The proposed rule making includes DP standards and has been hotly contested by the Computer and Business Equipment Manufacturers Association, although the FTC has been supported on this issue by the Computer & Communications Industry Association [CW, Feb. 4].

The Senate bill faces an uncertain future, however. President Carter, without going into specifics, said he would veto any bill that "crippled" the FTC. Also, similar FTC legislation, passed by the House of Representatives last November, does not include any ban on FTC standards activity.

The two legislative bodies will meet within the next few weeks to try to work out a compromise between the two versions.

DP Matching to Foil Food Stamp Abuse

The U.S. Department of Agriculture has issued new regulations to help states use computers to detect fraud and abuse in food stamp programs.

Beginning in July all applicants for food stamps must supply a Social Security number. States can then match recipient records with Social Security files to determine if the individual's income is low enough to qualify for the food assistance program.

According to government figures, in fiscal year (FY) 1979 approximately \$30 million in food stamps was improperly issued because of fraud or administrative error. In FY 1978, the year for which the latest figures are available, over \$5 billion worth of food stamps were issued.

Agriculture said the new computer matching procedures and other administrative changes being made in the food stamp program are expected to lead to savings of \$80 million beginning in FY 1981.



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Minis Stay on the Ground

U.S. Making Detailed Maps From Data Sent by Satellites

By David Sloan

Special to CW

RICHMOND, B.C. — Electronic eyes more than 500 miles out in space, aided by a number of minicomputer-based and earthbound ground stations, are currently producing detailed maps used by countries around the world.

Far from being the kind that are usually folded six ways and stuffed into an automobile's glove compartment, however, these maps are used to evaluate global natural resources, track the spread of man-made pollution and determine safe shipping routes.

Using imagery data supplied by an assortment of meteorological satellites, including the National Aeronautics and Space Administration's (Nasa) Landsat, the U.S. government creates (sometimes daily) maps that can pinpoint everything from the best areas for road construction to the flow of ice in the Arctic Ocean.

The maps have also been used to identify previously mismapped sections of road, chart mislocated coastlines and coastal islands and even to spot fires in remote areas along with the closest water source to help fight them, a spokesman explained.

Multination Base

While the high-flying satellites are important to the remote sensing operation, the crux of the system lies in the computer-controlled ground stations. Located in Brazil, Australia, Argentina and other countries, these ground stations receive, analyze and process mountains of digitized data and structure it into an understandable form.

Each ground station contains an imaging system developed by MacDonald, Dettwiler & Associates Ltd. (MDA), based here in British Columbia. The systems consist of two identical Perkin-Elmer Corp. (PE) 32-bit minicomputers — usually PE's 8/32 with 256K bytes of memory — and a Comtal Corp. 2400 imaging CRT system, incorporating a high-resolution digital color display.

The basic system produces radiometrically enhanced imagery on black-and-white film, and it also produces

industry-standard digital computer tapes of the image sensor data. This bulk-corrected, multispectral scanner image sensor data has been corrected for distortions caused by the earth's rotation and for panoramic distortions caused by the swinging of the satellite's scanner mirror. This bulk-corrected data is further analyzed by MDA's image analysis system.

Tracking Operation

Actual operation of the ground station begins an hour or more before the satellite passes over it, when the operator enters into the system the name of the satellite to be tracked. The system predicts the orbital information which indicates in addition to other essential information, where to acquire data from the satellite.

This data is fed to the automatic tracking system, which points the antenna in the proper direction and then waits for acquisition of the signal.

Once the signal is received, the antenna automatically tracks the satellite during its pass of 20 minutes or less. During the pass, the system front end accepts the signal and puts it into a format suitable for processing.

During the receiving phase, data is passed through a high-speed memory, developed by MDA, that acts as a go-between as the satellite passes information down to the computer. The memory corrects the data before it travels to the image data processor.

Concurrently, data is being recorded at the front end on a special digital tape recorder. This process continues for the duration of the satellite pass.

At the end of the satellite pass, the operator takes the imagery film and develops selected portions, depending on the quality of the data and interest in the location. Meanwhile, the digital tape can be used for more detailed information on a specific global area.

Selective Processing

The quantity of data transmitted by each satellite is so great that it must be selectively processed by the computer. For instance, one typical picture image contains 2,000 lines with 3,200 pixels — a pixel is a digital sample of one picture element containing 8 bits of data. To further complicate matters, one image of approximately 24 million pixels is transmitted by a passing satellite every 25 seconds.

Specially trained interpreters determine which portions of data should be examined, discarding imagery that is covered in clouds or distorted by equipment malfunction.

One PE minicomputer performs the control function for the entire remote sensing and imaging system. The second 32-bit machine is a backup for the first, since most ground stations are located in remote areas and not on a normal maintenance or service route. The backup processor can also be used for software program development, data processing and image analysis.

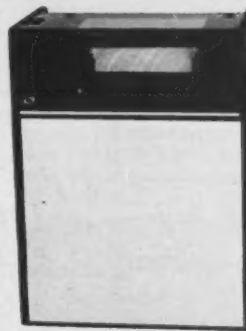
The bulk of the system software coding is in the Fortran language, but some is implemented in microcode using PE's writable control store.

Sloan is a principle scientist with MacDonald, Dettwiler & Associates Ltd., based in Richmond, B.C.



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Four Nabbed in MPU-Based Child Porn Scheme

By Jeffery Beeler

CW West Coast Bureau
LOS ANGELES — Local police have arrested four men and expect to nab many more in connection with a child pornography scheme that one of the suspects allegedly managed with the help of a homemade microcomputer system.

An undercover investigation of the scheme has resulted in the arrest of John Likins, an electrical engineer who allegedly used the system to keep track of pornographic materials earmarked for sale to pedophiles throughout the U.S.

The materials, whose sale was apparently aborted by Likins' arrest, consisted of photos and films depicting lewd acts involving men and young boys.

Investigators discovered the system, which apparently was built with parts from a Heathkit Electronics Center, in Likins' home, where a floppy-disk unit maintained a file of hundreds of prospective kiddie-porn customers, according to police detective Lloyd Martin.

In addition to listing the customers' names and addresses, the data base allegedly con-

tained information describing each buyer's personal preferences in child pornography.

A second data base, meanwhile, provided an inventory of every pornographic photo and film title in Likins' alleged product line, Martin said. Each title was identified by a unique catalog number and accompanied by a brief description of its contents.

By cross-checking the customer list with the product catalog, Likins could allegedly match potential buyers with child pornography tailored to their individual specifications.

Parallel Scheme

At first, Likins' alleged operation was thought by police here to be the only known computer-based child pornography ring in the world. But shortly after the suspect's arrest, they learned another such scheme had been exposed by police in nearby Ontario and Chino, Calif., Martin said.

Thus far, police have uncovered no evidence linking Likins to the second case, which allegedly involves a suspect known variously as Raymond Kapalka, Stephen Damian Hunter and Stafford Bentley Bright.

In the Likins case, police got their first big break after answering a classified ad in an obscure, underground publication catering to pedophiles. The response led eventually to a meeting between Likins, 38, and undercover police officers posing as pedophiles and potential child-pornography customers, Martin said.

Unsuspecting, Likins took

the officers into his confidence and finally invited them to visit his home in nearby Hacienda Heights.

There, police discovered a setup that allegedly included the computer system, an extensive photo lab, a bedroom equipped with spotlights and video tape cameras and equipment for duplicating pornographic photos and films.

Recent Operation

They also allegedly discovered enough unsold kiddie-porn to fill an entire bedroom of the suspect's house. To Martin and other members of

the Los Angeles Police Department's Juvenile Division, the size of Likins' purported holdings suggests he had just recently entered the child-pornography business.

"We think we got in on the ground floor of the operation," the police detective said. "If we had caught him just a year later, he would probably have been the biggest dealer in his field."

Likins allegedly served as the ringleader of a child-pornography scheme that is also said to have included at least four other suspects.

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Spectrum-1 Users To Hold Meet On Management

LAKE GENEVA, Wis. — A Spectrum-1 Users Conference will be held here April 14-15, sponsored jointly by the Management Information Services Division of Abbott Laboratories and the Management Systems Department of Indiana University.

Spectrum-1 is a project management methodology marketed by Spectrum International, Inc. of Los Angeles and currently used by 150 companies.

Conference workshops will deal with typical problems encountered in the management and control of DP projects, with emphasis on organizational issues, project control software and management techniques.

The registration fee is \$15. Further information may be obtained from Jack White, assistant director of management systems, Indiana University, Room 300, Morgan Hall, Bloomington, Ind. 47405.

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Managers on the Move

RONALD H. PILCHER has been promoted to assistant vice-president of the Trust Co. of Georgia, an Atlanta-based bank holding company, and assigned to Trusco Data Systems (TDS), the holding company's statewide data processing organization.



Ronald H. Pilcher

Pilcher has been employed by the Trust Co. since 1965 in various positions. He most recently served as manager of on-line systems in TDS.

...

TIMOTHY L. CHERNEY has been appointed vice-president and named company management information systems director at Fidelity Savings & Loan Association in Oakland, Calif. Cherney will be responsible for administration of the Data Processing and the Systems and New Products Development departments.

Prior to joining Fidelity Savings, Cherney was employed by Allstate Insurance in Pasadena, Calif., as com-



Timothy L. Cherney



George B. Hopkins

puter operations supervisor; by Ralph's Grocery Co. in Los Angeles as manager of computer operations; and by Burlington Northern in Newport Beach, Calif., as director of data processing.

Cherney holds a B.A. degree in English from California Polytechnic State University in Pomona.

GEORGE B. HOPKINS has been named director of management information systems at Zeecon Industries in Dallas.

In his new position, Hopkins is also in charge of developing long-range systems plans. He joined Zeecon after moving from a sister company in Grand Island, N.Y., where he was responsible for a major integrated network for labor reporting and plant maintenance control. Prior to that, he worked with a division of General Motors Corp. in Pontiac, Mich.

Hopkins received his B.S. degree from Morris Brown College in Atlanta and worked toward his M.S. degree at Ohio State University in Columbus. He also studied at Whittier College in Copenhagen, Denmark.



Phyllis C. Jones

PHYLLIS C. JONES has been elected an operations officer by the Trust Co. of Georgia. Jones was assigned to

Trusco Data Systems (TDS), the holding company's statewide data processing organization.

Jones joined Trust Co. in 1975 as a programmer in TDS following employment with the Wilmington Trust Co. in Delaware as a computer programmer and with the C&S National Bank in Atlanta as a systems analyst. In 1977 she was named systems programmer in TDS technical services and later was named manager of operations systems support in TDS.

Jones has completed a number of IBM courses and seminars in electronic programming.

...

LOUIS EDGAR AGOSTINI has
(Continued on Page 26)

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Managers on the Move

(Continued from Page 25)
been named computer services officer at the Bank of New Jersey in Camden.



Louis E. Agostini

Agostini presently serves as computer operations manager and will continue in that capacity as an officer. Prior to joining the Bank of New Jersey in 1979, he was affiliated with Catalytic, Inc. in Philadelphia, where he served as operations manager.

Agostini received his A.S. degree at Camden County College.

...

T.G. CONNOR JR. has been named senior vice-president and manager of automated customer services and CHARLES W. KIGHT has been elected senior vice-president and manager of data processing services in the Operations Department of Republic National Bank of Dallas.

Connor was formerly vice-president

with Affiliated Computer Systems, Dallas. He has also served as vice-president of operations for the Leader



T.G. Connor Jr.

Corp., a subsidiary of Boeing, from 1974 to 1976.

Kight has served in various capacities with Texas Instruments, Inc. since 1968, including manager of financial planning and analysis, manager of financial systems, manager of corporate systems and as a division manager of information systems and services.

Republic also announced that STANLEY M. JOSEPHSON, senior vice-president, will head a new division, Advanced Systems Planning. In that capacity, he will be responsible for long-range systems planning.

...

RONALD M. REYNOLDS has been named vice-president of data processing at Guardsman Life Insurance Co. in West Des Moines, Iowa.

Before joining Guardsman, Reynolds was director of data processing for Garst & Thomas Hybrid Corn Co. in

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Charles W. Kight



Ronald M. Reynolds

Coon Rapids, Iowa. Prior to that he was the director of systems and programming for American Mutual Life Insurance Co. in Des Moines.

Reynolds holds a B.S. degree in business administration from Drake University.

...

JERRY K. CLARK has been appointed director of corporate information systems at the A.E. Staley Manufacturing

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Managers on the Move

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Prior to joining Staley, Clark was employed at the General Tire & Rubber



Jerry K. Clark

Co. in Akron, Ohio, as manager of corporate computer services. Before that, he held data processing and accounting positions for PPG Industries.

Clark holds a B.A. degree in accounting from Texas Technical University in Lubbock, Texas.

...

Liberty Mutual Insurance Co. in Boston has announced several



Stanton T. Smith

management-level changes in its Data Processing Department.

STANTON T. SMITH, vice-president, has been named assistant manager of data processing, and PAUL E. KEATING has been appointed data base manager in the newly created Data Base Management Department. Smith had been serving as vice-

president and manager of home office statistical operations, while Keating was vice-president and manager of home office data processing.

RICHARD S. MARSHALL has been named vice-president and manager of data processing. Marshall had been serving as assistant vice-president and manager of Liberty Mutual's DP-Field Operations Department in Burlington, Mass.

In addition, CARL N. BLETZER, manager of systems and programming, MAURICE J. FITZGERALD, manager of statistical operations, and A. VAUGHAN SANBORN, manager of data processing administration, have been appointed assistant vice-president in the Data Processing Department.

P. RICHARD GALANIS has been appointed director of telecommunications on the data processing staff at



Paul E. Keating

General Telephone & Electronics Corp. in Stamford, Conn.

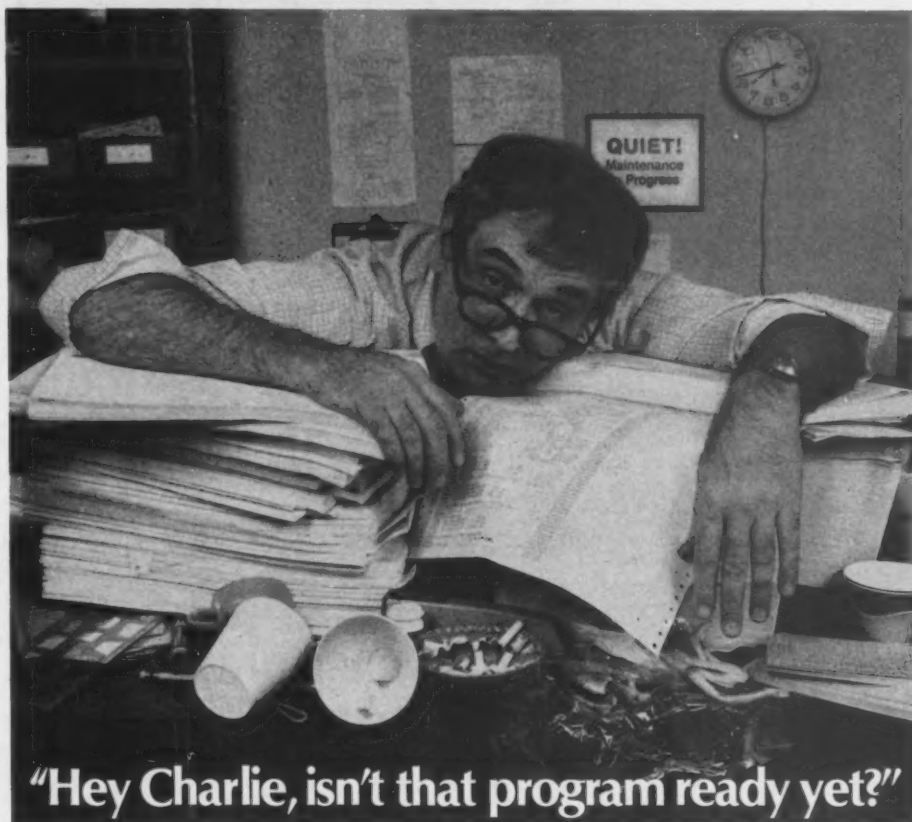
Galanis has served in various positions with the GTE Communications Products organization since 1957. Most recently he held the job of programs manager for the Sylvania Systems Group, a part of GTE.

He holds a B.S. degree in industrial engineering from the University of Buffalo, N.Y.

...

WILLIAM E. KAVAN has been promoted to vice-president of management information systems at Sifton Brothers, Inc. in Los Angeles.

Kavan has been employed with Sifton for seven years as director of information services.



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Publisher Seeks to Track Terrorists by Computer

By Brad Schultz

CW Staff

LAS VEGAS — Know of any plans for terrorism in your neighborhood? A publisher here has opened a telephone "hot line" service called "Computers Against Terrorism" (CAT) that allows people to report such schemes to a speech recognition device.

The device induces a printer to generate hard copy of the telephone report, according to Ryan Emerson, president of International Intelligence Report, Inc. The publishing company's staff of former intelligence professionals will reject reports from people they consider to be "cranks," Ryan said, but information that seems bona fide to them will be reported to the caller's local police department.

CAT calls will not be recorded on audio tapes and no copies of the corresponding printouts will be made, Emerson emphasized. The publisher of *International Intelligence Report* — a monthly magazine with a circulation Emerson put at 13,000, mainly corporate, subscribers — and another magazine, *Organized Crime Review*, will simply relay the reports to law enforcement agencies without compiling them in a data base.

The nonprofit service therefore does not violate anyone's civil liberties, the publisher maintained.

Despite the name chosen for this project, Emerson has yet to link the speech recognition and printer configuration to a genuine computer system. In fact, the publisher told *Compu-*

terworld CAT staffers are not really planning to buy a processor. They want one donated.

No Offers

Towards that end, a number of computer manufacturers have already been asked to make such a contribution. However, IBM has turned them down and no other vendor appears ready to help out, Emerson said.

Because CAT is offered as a nonprofit "public service" (without charge to participants), International Intelligence Report hopes to get the use of a computer on the same basis, he explained.

How would a computer be applied? Having ruled out data base support, CAT apparently would employ a pro-

cessor as a kind of message switch, allowing more phone calls to be handled faster.

Emerson conceded, however, that neither the project nor the sponsoring publishing house has a formal DP staff to administer a complicated system.

Emerson has also asked Nevada's Central Telephone Co. to donate a toll-free "800" number to the cause. However, the utility rejected that proposal.

International Consortium Seen

Nevertheless, the publisher — who described himself as a former specialist in the study of terrorism for a "national intelligence agency" — is determined to push ahead with the project. CAT is supposed to help official law enforcement and federal security units grapple with what Emerson claims is an international consortium of terrorist groups, each including a number of highly skilled saboteurs and assassins.

About 100 terrorist organizations recently engaged in a strategy-making conference in Mexico, Emerson claimed, adding that Portugal hosted a similar conference this week. Emerson said this information comes from his company's staff of correspondents, which consists of six overseas and five domestic journalists who write for both of the firm's publications.

The terrorist bands swap people and equipment among each other as needed for such activities as the recent shootings of U.S. Army personnel in Puerto Rico, Emerson claimed.

Caution Urged

Asked to comment on how CAT might affect the civil liberties of callers and those on whom the calls inform, *Privacy Journal* Publisher Robert Ellis Smith said "extreme caution" will be required to keep the service within the bounds of privacy legislation and to avoid unwarranted defamations.

Assuming that the project eventually incorporates a computer system, CAT may be the first application of personal computing to crime prevention and intelligence activities, Smith remarked.

Emerson noted that law enforcement agencies are not likely to lend assistance to CAT because, the publisher said, such agencies traditionally try to retain full control and responsibility for investigations and prosecutions. Moreover, those public agencies are already accessible to citizens with suspicions to report.

Emerson can be contacted at International Intelligence Report, Inc., P.O. Box 356, Las Vegas, Nev. 89104.



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CW



'Use the Word "Throughput" at My Party One More Time, Mr. Feldcamp, and I'll Break Your Eyes.'

On Magnetic Tape Patent Files Available for Lease

WASHINGTON, D.C. — The Commerce Department recently announced that several Patent and Trademark Office (PTO) files are now available on magnetic tape for lease through the National Technical Information Service (NTIS).

According to the NTIS, the move is in line with President Carter's Industrial Innovation Initiative, announced last fall, to increase transfer of technical information [CW, Nov. 19].

The files being made available include the Patent Classification File, produced twice a year, which contains patent classification information on some four million patents indexed by patent number and classification.

The Patent Full Text File contains all the wording and drawings of approximately 650,000 patents. This file is produced weekly, adding about 1,500 new patents a

week. Both the weekly updates and the full file are available.

Bibliographic File

The Patent Bibliographic File, containing abstracts and basic information from the full text file, will also be leased on an annual basis. Test tapes are available to potential lessees, NTIS said.

Because a number of private

firms already offer this type of information, the government has said it will not compete with private industry in this area and is releasing these files only to enable those firms already in the marketplace to enhance services to their customers.

The files are so extensive and costly it is thought they would be of little use to individuals, the government said.

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Meeting Slated On Motivating DP Personnel

LOS ANGELES — Technology Transfer Institute will hold a two-day meeting here on March 27-28 and in New York on May 8-9, dealing with employee motivation and personnel productivity.

Aimed at management, the meeting will focus on how an organization analyzes its existing motivational environment and determines which areas need improvement. In addition, the sessions will cover key factors for motivating both supervisory and regular personnel, a spokesman stated.

The seminar will be presented by J. Daniel Couger, a professor of computer and management science at the University of Colorado and frequent *Computerworld* contributor, and Robert Zawacki, a professor of management and organization behavior, also at the university.

The registration fee for the event is \$450, including all documentation, lunches and breaks. Further information can be obtained from Technology Transfer Institute, P.O. Box 49765, Los Angeles, Calif. 90049.

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Mathematicians Divided on Soviet Algorithm

By Connie Winkler

CW Staff

NEW YORK — Mathematicians are divided on the significance of the recently heralded Soviet algorithm, but there appear few immediate applications of the algorithm to real-world linear programming problems [CW, Dec. 10].

Calculating one real-world linear programming problem using the Khachian algorithm (after L.G. Khachian of the Soviet Academy of Sciences) would take 1.2 quadrillion steps, according to Univac's Dr. Edward H. McCall.

"That's staggering. I guarantee you'll run out of computer time," he told a group of 80 gathered at a rare workshop sponsored by the Mathematical

Programming Society here recently.

The mathematicians acknowledged they were at the workshop because of the publicity concerning the algorithm, which probably peaked with a November 7, 1979 front-page *New York Times* story. "A Soviet discovery rocks world of mathematics."

The *Times* article implied this algorithm could be used to solve the commonly known "traveling salesman problem," which was described as a linear programming problem.

The traveling salesman problem is one that, for example, tries to determine the least expensive route for the salesman to make his calls. However, mathematicians here claim the algorithm cannot be used in this manner.

"The excitement the press has stirred

up... must be unique in the annals of applied mathematics," Philip Wolfe, chairman of the Mathematical Programming Society, observed.

"I'm very discouraged in doing anything with this," Michael Grigoriadis of IBM's Data Processing Division said. Grigoriadis spelled out his methodology noting he ran 30,000 iterations and still did not get satisfactory answers using the algorithm. "It may not be enough to do even a million iterations."

One of the attendees, John W. Gregory, applications analyst at Control Data Corp., said he gets calls from customers wanting to use the new algorithm. He said he tells them if they can get the algorithm to solve one problem and if they can afford the cost of the

computer time that would be needed, they can use the algorithm.

However, enthusiasm for the Khachian algorithm remains — if tempered.

"A lot of people are down on the Khachian because it isn't as competitive as the simplex algorithm," Joseph G. Ecker of Rensselaer Polytechnic Institute, said. "For linear programming problems, that may be. On the other hand, Khachian offers exciting new ideas [for] solving nonlinear problems."

As with linear programming problems, there are numerous nonlinear ones such as engineering design problems that involve selecting the right variables to optimize.

The simplex algorithm was propounded in 1947 by George B. Dantzig of Stanford University. Ecker, a professor of mathematics, suggested that much of the excitement over the Soviet algorithm may have been generated by the fact that the simplex algorithm was thought to be the last word in linear programming.

Ecker said he is going to continue to apply the Khachian algorithm to combinatorial and quadratic problems, which Khachian was doing in his work.

Theoretical Value

The Khachian algorithm definitely has theoretical value, and it may be necessary to let the dust settle to see additional significance, Bernhard Korte of the University of Bonn argued.

Manfred Padberg of New York University's Graduate School of Business also agreed the algorithm has theoretical value and will definitely be included in textbooks.

Khachian is a mathematician at the computer center of the Academy of Sciences of the U.S.S.R., and his algorithm and short note appeared in the January-February 1979 issue of "Doklady," the proceedings of the Soviet Academy of Sciences.

The work was translated, reconstructed and presented at the Tenth International Symposium on Mathematical Programming in Montreal late last August.

Shortly thereafter the story began appearing in the popular press. This spread to the West was "quick work in the field of mathematics," Wolfe reported.

Much work remains to be done — and the mathematicians are not even certain what the new algorithm should be called. Following the workshop several of the programming society members voted to give the generic name "ellipsoid algorithm" to the Khachian algorithm, paralleling the naming of the simplex algorithm.

The ellipsoid name was proposed by Wolfe because conceptually the algorithm uses ellipsoids to focus on the answer.

During the discussion it was noted that Khachian's work is built on or follows that of three other Russian mathematicians: D. B. Judin, A.S. Nemirovski and N. Z. Shor.

Wolfe noted he is planning another panel on the algorithm in May in Washington, D.C., at the joint meeting of The Institute of Management Sciences and the Operations Research Society of America.

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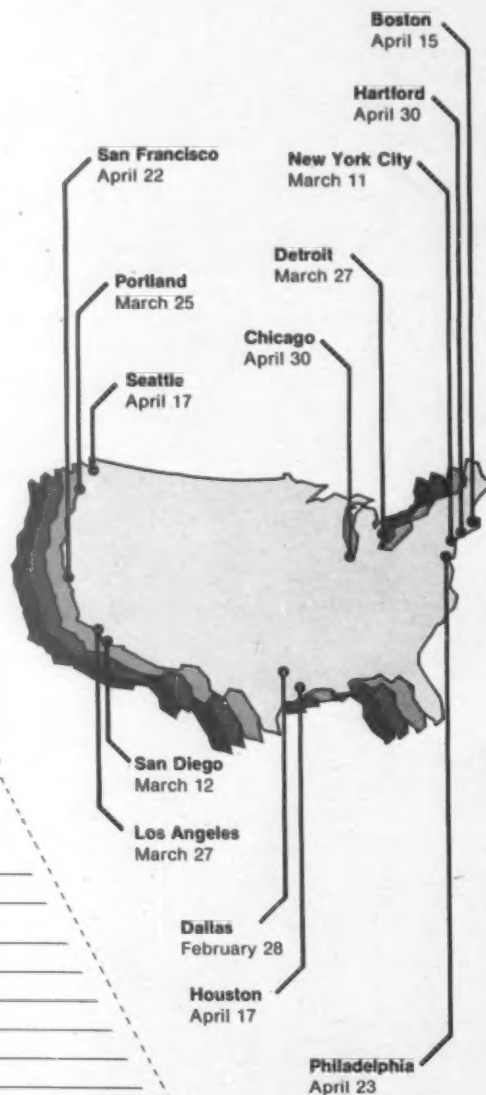
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One-Day Workshop to Cover Cataloging of Social Science Files

ARLINGTON, Va. — The International Association for Social Science Information Service and Technology (Iassist), an organization active in managing and archiving machine-readable social science data files, will sponsor a one-day workshop May 1 in Washington, D.C.

Slated to precede the association's annual conference, the workshop will consist of concurrent sessions focusing on 1980 U.S. Census data and soft-

ware, international census and fertility data and the evaluation of a variety of data files.

In addition, the meeting will cover the library cataloging of machine-readable data files, a spokesman stated.

The cost of the workshop is \$30 for Iassist members and \$45 for nonmembers. However, participants can preregister for both the workshop and the three-day conference for a single fee of \$75 for Iassist members and \$100 for others.

Additional information can be obtained from the organization's Barbara Aldrich, 2715A S. Walter Reed Drive, Arlington, Va. 22206.

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Seminar to Eye Bell Offerings

ANN ARBOR, Mich. — A seminar on "Dimension Systems and Tandem Networks" sponsored by The DMW Group, Inc. will be held in New York Feb. 27-28, Chicago March 12-13, Los Angeles March 25-26 and Houston April 8-9.

Designed to give insight into the technical capabilities and limitations of the Bell System computerized offerings and non-Bell alternatives, the seminars will be conducted by James Hilderbrand and James Doherty.

Hilderbrand was formerly the manager of product development for Dimension Systems at the Bell Laboratories in Denver. Doherty was formerly an assistant vice-president at Equitable Life, where he was responsible for the installation of the Danray CMX 8000, reportedly the largest interconnect system installed to date.

The seminar will cost \$425 per person but \$350 for additional attendees from the same company. The DMW Group, Inc. is located at 2395 Huron Parkway, Ann Arbor, Mich. 48104.

Conference Set On CPU Capacity

SAN FRANCISCO — Papers, studies and results of experiments will be presented at the second annual international Conference on Computer Capacity Management, which will be held April 8-10 at the Fairmont Hotel here.

Sponsored by the Institute for Software Engineering, the conference will cover work load characterization, forecasting and management; equipment planning and service-level management; and performance prediction, measures and reporting, according to chairmen Dave Schumacher and Dave Morley.

Complete details are available from either Schumacher or Morley at the Institute for Software Engineering, P.O. Box 637, Palo Alto, Calif. 94302.



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EDITORIAL

FAA Missing the Mark

The Federal Aviation Administration (FAA) has once more demonstrated what can only be construed as a serious lack of interest in air safety — the very concern it was commissioned to address 22 years ago.

Immediately following the installation of an experimental Arts III-A air traffic control (ATC) computer system at Tampa International Airport last May, controllers there began voicing complaints about the system's extreme unreliability [CW, Feb. 11].

Besides erroneous and missing data tags, flickering radarscope screens and radar tracking of highway trucks and railroad cars, controllers have documented 27 planned and 30 unplanned system interruptions between June 11 and Dec. 3.

That number is "considerably" higher than the number of system failures that occurred with Tampa's former Arts III ATC system and has resulted in ATC confusion and danger to passengers many times since May, controllers claim.

After verbally promising not to remove Tampa's Arts III system until Arts III-A proved totally dependable, the FAA last July decommissioned Arts III and sent it to Chicago's O'Hare International Airport to solve memory problems there. As a result, Tampa International has nothing to work with but an unreliable, one-of-a-kind prototype system.

Arts III-A promises to be a superb system when the bugs are worked out, but a busy airport is no place to try out an imperfect air traffic control system.

Meanwhile, the FAA's continuing flagrant disregard for the stated needs of controllers could well result in tragedy for innocent air passengers.



LETTERS

Salary Surveys

A recent article on DP salaries characterized the Source EDP salary data as "optimistic," compared with A.S. Hansen's survey and your own [CW, Feb. 11].

As a former branch manager at Source EDP and a current competitor, I submit that the Source survey measures a different universe. Your surveys reflect current salaries of all employees. Source's reflects the current salaries of active applicants, who are not a valid universe of DP professionals, but rather a sample biased toward the most competent. Source, like other placement firms, does not make active applicants of those it cannot place: those with marginal performance, bad references and poor job records.

Consider the Source EDP data as current market salaries of those you'd like to hire, as bases for replacement costs, before adding on the direct and indirect costs to find, hire and train comparable successors. To defend salaries with marginal producers, use the Hansen survey. The Source survey represents LIFO, the Hansen survey, FIFO.

Thomas S. Ahern

Systems Careers
San Francisco, Calif.

Performs as Advertised

Last October we were in an IBM center to perform some tests on some of our 360/30 software as well as to attend a demo on a 1M-byte 4331.

Starting with DOS Release 26, the major test conducted was that of our daily insurance system, a system written in assembly language and consisting of a fair amount of overlay modules. The model office test ran without incident and without a single program rewrite or JCL changes. This was made possible by running DOS Release 26 under VM/370 and emulating 2311 disk drives on the 3310's direct-access storage device.

As we are expecting delivery of a similar model in late 1980 to replace our 360/30, these tests confirmed to us that we will be able to make a rapid changeover without any conversion effort. We will then be able to migrate to 4331 native mode at our own speed.

To summarize, it appears that IBM has come up with a product that will perform as advertised.

Paul J. Cormier
DP Director

Mutual Life Insurance Co.
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A Few Tricks

IBM is learning a lot from Amdahl Corp. Its 3033 N series is just the first that is comparable to the 470V/7B.

Its next series will be comparable to the V/6 and V/7 and -8 series of Amdahl. The inability to upgrade from a standard 3033 to this new series, which will predate the H series announcement of equipment, will be announced before this summer.

The H series announcement will be delayed until early 1981. The N series has taken care of 3032 users in making their equipment completely obsolete. It never was any better than a 370/168 Model 3.

Is Gene Amdahl teaching Frank Cary a few tricks? Cary now realizes the next announcement will be for the multiple-user 3033 accounts, and Amdahl does not have an AP. Watch out, Gene. Frank has a few tricks like 16K chips instead of 64K chips (remember the 2-microsec 360/30), incompatibility without software and micros vs. macros.

George S. McLaughlin
Summit, N.J.

Computerworld welcomes comments from its readers. Letters should be addressed to Editor, Computerworld, 375 Cochituate Road, Rt. 30, Framingham, Mass. 01701.

DATA PAST

Five Years Ago Feb. 19, 1975

WASHINGTON, D.C. — Surveillance data on civilians and civilian organizations gathered by the U.S. Army prior to 1971 and ordered destroyed by a Department of Defense directive was never destroyed but instead was filed with the Army's foreign intelligence records gathered since June 1974. The admission came in an Army Department news release explaining that the 400 microfilm documents, computer-indexed by name of individual, name of organization and by topical event, had been found.

WASHINGTON, D.C. — The Retail Clerks International Association sought to insert a clause in both new and renewed contracts with supermarkets to prevent the layoff of any union member as the result of conversion to an electronic checkout system. The

clause would not affect personnel loss through attrition, a union spokesman pointed out.

Eight Years Ago Feb. 16, 1972

WASHINGTON, D.C. — Plans to transmit computer-based criminal information using an experimental satellite were being considered by the Federal Bureau of Investigation here with the backing of the National Aeronautics and Space Administration.

MENLO PARK, Calif. — Researchers at the Stanford Research Institute concluded that the danger of having a tape library wiped out by an intruder carrying a concealed magnet had been grossly exaggerated. Although a man carrying a 100-lb magnet in a tape library could do considerable damage, they said, he would scarcely go unnoticed.

READER COMMENTARY/Dr. Edward H. McCall

Soviet Algorithm Not Really a 'Breakthrough'

"Experts See DP Promise in Soviet Algorithm" [CW, Dec. 10] contained statements regarding the use of L.G. Khachian's algorithm for linear programming (LP). However, some of those statements were either incorrect or at the very least, exaggerations. Following are the specific quotes of concern:

1. "Khachian's breakthrough ... In essence, the Soviet discovery provides a mathematical shortcut for solving linear programming problems ... the algorithm 'allows you to examine large chunks of a problem at one time and lets you zoom in on the solution' in considerably fewer steps than the simplex method requires."

Has Khachian's algorithm really provided a breakthrough for solving LP problems? Has it really been shown that Khachian's algorithm solves LP problems in considerably fewer steps than the simplex method? Let us look more closely at the expected performance and resource requirements of the Khachian algorithm.

The information most likely available to Dr. Ronald Graham (to whom *Computerworld* attributed the above statements) was the translation of Khachian's paper [2] by Gacs and Lovasz [1]. The polynomial time property of Khachian's algorithm is given by a theorem in Gacs and Lovasz [1] which states that if a solution is not found in $6n^L$ steps of Khachian's algorithm, then the system of inequalities and equalities being solved by Khachian's algorithm.

In the $6n^L$ term (the polynomial time value), n is the number of variables in the system of inequalities and equalities being solved by Khachian's algorithm and L is the space needed to state the problem, that is, L is essentially the number of bits required to store in a binary computer all of the constants in the system of inequalities and equalities being solved by Khachian's algorithm.

Note, then, that the polynomial time value is an upper bound on the number of steps required by Khachian's al-

gorithm to find a solution if one exists and is the number of steps required by Khachian's algorithm to determine that the system of linear inequalities and equalities being solved by Khachian's algorithm has no solution. How large is that value? A recent report [4] provides that value and other Khachian algorithm values for a set of 16 real-world LP problems. Results for two of those problems are given below.

Small Problem

Consider first a 355 constraint LP problem (a small LP problem) that in 1973 required 1,692 iterations and 4.458 minutes of CPU time on a Univac 1108 computer to be solved by the simplex method. The polynomial time

upper bound of steps required by Khachian's algorithm to solve that problem, $6n^L$, is 1 trillion steps. For a computer that can execute a floating point multiple in 1 microsecond, that many steps may require 59,329 years of computer time to be executed.

Further, if an LP problem similar to that problem does not have a solution, then that number of steps and approximately that much computer time will be required to make that determination. In addition, based on precision requirements stated in Gacs and Lov-

asz [1], to maintain the validity of the polynomial time property for Khachian's algorithm may require as much as 1.9 billion bits for each word of storage and each floating point multiply/add/subtract/divide. Also, a 100% dense matrix with dimension 1330×1330 may have to be processed at each step of the algorithm. A matrix of that size would have 1,768,900 elements.

Consider next a 4,074 constraint LP problem (a large LP problem) that in 1973 required 1,217 iterations and 40.596 minutes of CPU time on a Univac 1108 computer to be solved by the simplex algorithm. The polynomial time upper bound of steps required by Khachian's algorithm to solve that

problem, $6n^L$, is 1.2 quadrillion steps. For a computer that can execute a floating point multiply in 1 microsecond, that many steps may require 5.6 billion years (5,600,000,000) of computer time to execute. Further, if an LP problem similar to that problem does not have a solution, then that number of steps and approximately that much computer time will be required to make that determination.

In addition, to maintain the validity of the polynomial time property for Khachian's algorithm may require as much as 245 billion bits for each word of storage and each floating point multiply/add/subtract/divide. Also, a 100% dense matrix with dimension 11981×11981 may have to be processed at each step of the algorithm. A matrix of that size would have 144 million elements.

Imprecise Tool

The above states upper bounds (except for the number of steps required to determine that no solution exists; the full polynomial time number of steps will be required to make that determination). However, there are indications that a significant percentage of those upper bounds will be required by Khachian's algorithm. An algorithm that will require an unfeasible amount of computer time if a problem has no solution and will most likely require an unfeasible amount of computer time even if the problem has a solution is not a practical algorithm.

(Continued on Page 36)

THE TAYLOR REPORT/Alan Taylor

Human Interface to Decide Coding Fight

The coming victory of disciplined coding over undisciplined manual coding in almost all production systems seems assured. The various disciplined approaches are gaining ground both because of the pure advantages predictable code provides in any given situation and because of the increasing demand for fast, flexible, maintainable code arising from the growing use of modern terminals, networks and fast-changing hardware configurations. Indeed, manual coding's major role, as far as production is concerned, seems to be similar to that of a pacing car or horse in prerace activities — it sets up standards that can be used to evaluate just how well the real contenders can perform.

There are now two major groups of contenders for production programming work: the manual disciplines, notably structured or top-down programming, and the generators. During the '70s, both made considerable strides and some variations in their approaches evolved. Structured programming, for instance, moved out of the purely scientific area and successfully embraced commercial programming, winning its Cobol spurs in 1978. At the same time, methods of organizing programmers improved, and automatic detailed and responsible inspections were shown to be another worthwhile technique for use in manual situations.

ations.

The generators, after staying quiet through most of the decade, almost started to explode in the late '70s. Older systems such as Score were revitalized, and new systems, including Black's and Progeni Cobol generators, were the subjects of performance stories that suggested that most programs could be coded the same day their specification was completed — and that this could normally be handled during coffee breaks.

Common Unpopularity

The one thing that seemed to be against both systems was their inability to win over the masses. Progress was spotty despite success stories of only six errors per thousand lines of code with structured systems or demonstrations that a generator produced totally error-free code for 95% of the programs required in a system. One department in a large organization would demand such a system, be successful and yet be unable to persuade anyone else in the organization to try it. Typically, a backer of the new systems would leave and the programmers would happily revert to the old way of doing things. Similarly, a rush project would be completed with the generator, but newer, less rushed projects would continue to be handled manually.

The rivalry now is not so much between disciplined and manual approaches as between the different claims of the structured and generator approaches. In this, at least for commercial systems, I think the unenthusiastic reception for structured programming will continue to keep it out of mass favor. At the same time, the poor welcome for individual generators will dissipate as the generator's externals are seen to be incidental to the basic generator approach; the generators will eventually improve and become acceptable to the mass of programmers.

Approach Differences

The generator/structured difference lies in the way the two system types approach the positioning of human input. Structured programming is structure-based. Anything that has to be handled prior to allowing access to a data record, for instance, has to be fit into one logical notch. A failure here destroys the predictability of output on which the structured virtues depend. As such, the theory of structure takes precedence over human convenience in organizing the interface.

In brief, a structured programmer is really acting as a computer himself, reorganizing his thoughts to fit the logic of the process. The rewards are great, but so is the cost because the

top-down structures simply do not follow the way humans develop, learn or review processes.

Generators, on the other hand, are much more adaptable to human thinking. In the typical generator, the system designer tries to accommodate human thinking as at least a secondary goal. Prompts, symbolism, reviews, defaults and so forth — as well as holding connected items together — are all part of the generator system designer's tools. The programmer can concentrate on the whole topic and be prompted and provided with defaults to speed the process. He doesn't have to also concentrate upon the location of the structure attachment and doesn't risk the damage if the place is given wrong.

The human mind has many pattern features. Generators' input is being slowly adapted to match the question-inform-and-respond sessions used to develop programs and systems to take advantage of how the mind works. Already much is happening in this area. Structured programming, by contrast, will always ask its writers to carry the responsibility of understanding and conforming to the unhuman philosophical structures of the particular system.

This victory for successful, human-interfacing generators will occur in (Continued on Page 34)

History Lesson

Oh how people fail their history tests! I read with interest "Tape: Yesterday, Today, Tomorrow" [CW, Feb. 4].

I quote: "Scientists first considered the possibilities in late 1954 while searching for greater storage capacity, more flexible memories and off-line storage capabilities. By mid-1955, engineers at Ampex Corp. were developing a digital tape transport for magnetic tape that would be used as an off-line storage device for digital data processing systems. The engineers believed many storage problems would be solved with tape's fast access time and greater flexibility when compared with the punched cards generally in use at that time for data storage."

I wonder if the author ever heard of the Univac I? I don't know what those

8-lb reels of metal tape were that we used to feed in data and get results out of the Univac if they weren't magnetic tape!

I remember spending countless hours from 12 a.m. to 4 a.m. (the only time the engineers would give programmers test time) trying to get a sort through those crazy tape drives (with the catgut strings in the take-up reel assembly).

This was during the fall of 1951, at Eckert-Mauchly in Philadelphia. We also had a key-to-tape device called the uniprinter. By the end of 1954, we had put into production the first commercial computer application in the country (payroll) at General Electric in Louisville, Ky. This was done with a Univac I and it had 10 magnetic tape

drives.

Morgan W. Huff
Nashville, Tenn.

Taking Issue

We would like to take issue with two of the remarks appearing in "Great Hardware Advances of the '70's" by Dr. Sidney Fernbach [CW, Dec. 31-Jan. 7].

First, the author stated, "It was becoming evident that multiprocessing was around the corner."

Univac introduced its first multiprocessor computer, the 1108 II system, on Nov. 30, 1965 and has marketed and installed multiprocessor systems ever since that time. We have several

hundred customer installations based on multiprocessor configurations in current operation.

Second, the article stated, "The results are still not convincing enough to cause manufacturers to develop a line of products based on this architectural style (an array of micros)."

On June 5 last year, Univac introduced the Univac 1100/60 computer system — the first large-scale general-purpose computer to implement LSI technology with multiple microprocessor-based architecture. A number of these systems have already been successfully installed with reliability and performance standards well up to our expectations.

Michael M. Maynard
Manager, Press Relations

Univac
Blue Bell, Pa.

Fewer Controls, Please

I am both astounded and disappointed that *Computerworld* would waste as much space as it did on "A Proposal for Gas Rationing" [CW, Jan. 14].

Poorly conceived, ill-constructed, short-sighted government-imposed controls are what have caused our current crisis. The rationing proposal would subject us to still more controls. This nation was founded upon and grew to its strength because of its commitment to free enterprise and free markets. More controls equate to a loss of freedom and a corresponding loss of economic strength.

CW could better devote its talents to the support of free enterprise. I would submit, however, that the author would make an outstanding bureaucrat!

Jerry Havemann

Pocatello, Idaho

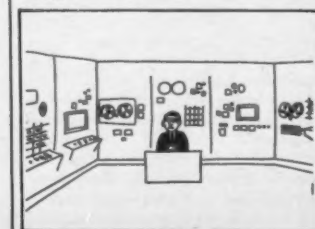
Human Interface
To Decide Issue

(Continued from Page 33)

both the development and maintenance phases. Structured program development means that structured programming methods have to be used throughout the system's maintenance. To the extent that trained structured programmers are going to be more expensive and scarcer than journeyman generative programmers, this means that the maintenance of structured systems will be more costly than the maintenance of the equivalent generated system. From a user's point of view, this difference in cost is important.

When it is to your turn to look at a generator, review the human aspects as well as the technical ones. It will be worth your while.

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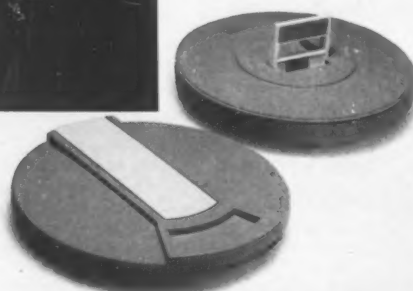
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Khachian Algorithm Not a Real 'Breakthrough'

(Continued from Page 33)

Khachian's algorithm is that type of algorithm.

In fact, except for LP problems that require the simplex method to examine each vertex, there is no evidence that Khachian's algorithm can beat the simplex algorithm. Further, those LP problems that require the simplex algorithm to examine each vertex are usually artificially created and of no computational interest since they do not reflect real-world problems and real-world problems are the problems of computational interest.

Even more, Rosen and Frawley [5] found experimentally on a finite computer, and for their test problems, that Khachian's algorithm was numerically unstable. Finally, McCall [3] has shown experimentally that for real-world LP problems the simplex method is essentially a linear time algorithm in actual performance.

Note that the simplex method linear time actual performance is not related to its exponential time worst-case performance (except that the worst-case performance provides an upper bound on actual performance). Khachian's method, however, has not been shown to have the potential of linear time actual performance.

In its current state, then, Khachian's algorithm is not a breakthrough in linear programming and can hardly be said to "... zoom in on the solution" in considerably fewer steps than the simplex method requires."

Other Problems.

2. "On the other hand, he [Graham] continued, the method does show some promise as a possible means of solving 'combinatorial optimization' problems ... This is not possible since most combinatorial optimization problems, including the traveling salesman problem, are integer programming problems and Khachian's algorithm has no provision for such problems.

Moreover, integer programming problems are a class of truly hard to solve problems, and no one has shown that linear programming problems and integer programming problems are in the same class of difficulty. Further, it is not possible to state the integer variable restriction in integer programming problems as a linear equality or inequality, and Khachian's algorithm only applies to systems of linear inequalities and equalities.

Some combinatorial optimization problems have LP formulations. However, even for those problems Khachian's algorithm has no special property that would make it especially useful.

3. "Khachian's method might also be used someday to yield approximate solutions to very difficult problems for which no exact answers are thought to be possible, Graham said." Perhaps. However, assuming the LP problem being solved by Khachian's algorithm has a unique optimum, the feasible space for Khachian's algorithm is a single point. Hence, every neighborhood of that point will contain both feasible and unfeasible values for the LP problem being solved by Khachian's algorithm.

It is not clear how to generate the ellipsoids so that every neighborhood of the optimum point would contain only

LP feasible values, and this is required if the Khachian algorithm is to be used to find approximate solutions.

4. There are other problems of the Khachian algorithm not stated above, but described in [4]. However, one additional point needs to be made. Specifically, because the $6n^2L$ value does not have a number of constraints (m) factor, it is often assumed that the polynomial time property is relatively independent of the number of constraints. For linear programming, this is not true. As shown by McCall [4], for linear programming $n = (m-1)/2$; hence, for linear programming the polynomial time value is a direct function of the number of constraints in the system of linear inequalities and equalities being solved by Khachian's

algorithm.

Furthermore, McCall [4] shows that for linear programming $n = n_{LP} + m_{LP}$, where n_{LP} and m_{LP} are the number of variables and constraints, respectively, in the LP problem being solved by Khachian's algorithm. Hence, Khachian's algorithm becomes more difficult as either the number of constraints or variables is increased in the LP problem it is to solve.

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McCall is with Univac in St. Paul, Minn., and is an adjunct professor of computer science at the University of Minnesota in Minneapolis.



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SOCIOLOGY OF COMPUTING/Robert L. Glass

Avoiding Layoff — A Convoluted Approach

Layoffs are the plague of the aerospace business.

If you win a billion-dollar contract, you run ads from Atascadero to Okeechobee to bring in the talent you need to do the job.

If you lose a billion-dollar contract, you shuck off all those people you brought in with the last hiring binge.

Heads you win, tails you lose. With people's lives hanging in the balance.

Wings Aloft Aviation has learned to live with that situation. And so did Walter Stallworth — at least for a while.

I first met Walter when I joined the Wings Aloft integrated data base IDB

organization, back in the late '60s.

Walter had one of the most innovative minds I have ever run into. Some people even called it devious. Take a tricky, convoluted problem and Walter would find a tricky, convoluted solution. Take a simple, straightforward problem and Walter would still find a tricky, convoluted solution.

For instance, there was Walter Stallworth's date conversion program, used throughout the company. He had once run into a problem in which he needed the difference between two calendar dates, in working days. Before Walter was through, he had constructed a family of routines that could

convert from any known calendar system to any other (would you believe Mayan to Julian?).

Boom to Bust

If you were in aerospace in those fateful late '60s, you may remember what happened. Business was booming. Computing was leading the way. Management information systems were the way of the future. Integrated data bases were the platform on which it all would be built.

And then the cookie crumbled. Business stopped booming. Times got tough. Computing became a drain on tight capital, not an innovative new re-

source. Integrated data bases became a superfluous idea whose time had vanished.

The crumbling cookie was especially crumbly to those of us in IDB. What had looked like a five-year assured job future became a six-months-to-wrap-it-up-nightmare. The decree had come down from management: IDB was being shut down.

Most of us simply licked our wounds, patched up our morale and set to work on the task at hand. Mothballing an interesting, promising project wasn't the greatest job I ever had. But then, back in those days, having any job was enough to make you grateful.

Walter Stallworth figured that he was due for certain layoff when the mothballing was complete. And he figured out a way to thwart it.

Most of the six months had passed by before I figured out Walter's ploy. He had set about a course of mothballing his portion of IDB which could never be completed! Oh, at any point in time he was always making progress. But the progress never took advantage of any past progress.

Walter had come up with a random walk approach to problem solution.

The philosophical issues here get kind of sticky. If a company is going to posture itself in a boom-and-bust business such as aerospace and decide human lives on the flip of a contractual coin, do its employees get to develop defense mechanisms to protect themselves? I mean, was it somehow right for Walter to posture himself so that the company simply couldn't lay him off?

Well, most of us, when we figured out what Walter was up to, didn't think so. In fact, we got downright angry to think we had been working our tails off while he had been intentionally going in circles. The more we thought about it, the angrier we got.

I don't know who finally blew the whistle on Walter. It wasn't me — I had long since deserted the sinking ship, going to work for Skyhook Air, which had won the last contract Wings Aloft had lost. (Itinerary was the defense mechanism most of us used in the aerospace business.)

I think Walter Stallworth was the only employee actually fired by Wings Aloft in 1971. All the others who left were laid off. But Walter had violated a code too critical to be forgiven. He had wasted the company's resources deliberately at a time when resources were too valuable.

The last time I ran into Walter, he had a job as a travel agent. He seemed to be pretty happy at it and even confided in me that his Wings Aloft lesson had been well learned — he wasn't about to cheat any more employers by choosing nonproductive paths. And in fact, I got so enthusiastic about his job that I asked him to plan a family trip to the Bahamas for me.

It was when he sent me the itinerary that I realized Walter would never really change. I mean, his hotel and airline choices in the Bahamas were impeccable, but routing me via Iceland and Gibraltar?

Tricky and convoluted he was — to the end!

SERIES 80 TOTAL. WILL YOU STILL BE SOLD ON YOUR DBMS AFTER YOU'VE BOUGHT IT?

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READER COMMENTARY/Jon R. David

DP Managers Need More Than Managerial Skill

The name itself, "computer," indicates the uses to which the original machines were put. Computing, particularly in the aerospace field, was the only type of application that could justify the enormous cost of the equipment and requisite environment conditioning.

In addition, the computers of 20 years ago were programmed with mathematical logic and at a level equivalent to internal machine operations. Since these computers were in mathematical/engineering applications and were used by mathematical/engineering personnel, the requirements for using a computer were read-

ily met and the constraints could be easily tolerated.

As the systems became accepted in commercial environments, the new business computer users assigned departments to treat them. We had computer rooms and computer departments, later called IBM rooms and IBM departments and, as we became more sophisticated, data processing departments. Today, the common term is "information processing departments."

Where did the people come from to operate and manage the early computer installations? Where do they come from now?

The first commercial computers typically replaced unit record processing systems. The staffs for these early systems were the unit record staffs whose equipment was being replaced. The unit record manager became the computer manager.

Computer systems were mostly faster moving unit record systems, and a magnetic tape was loaded instead of 20 or so boxes of punch cards. Additional tape drives were used so sorting could be done without human intervention.

Some early commercial installations were at companies that had no unit record processing. These companies primarily used computers for account-

ing, so all or part of an accounting department became the computer department and a head or senior accountant became computer manager. Systems at these companies usually automated manual processes, so things were done the same way and in the same sequence, but done faster with a computer.

Clearly, early commercial systems, by their very nature, could not have managers that understood computers and computerizing applications.

Present Situation

But who does the managing today? Are they any good at it? What would make them better?

We now have operations managers who control computer room operations, DP managers who control programming and systems managers who decide on the approach to processing data and to selecting equipment. In some cases, these managers are, as before, renamed senior accountants or unit record supervisors; this time, though, they've taken a three-hour (or one- or two-day) course on how to do their particular job(s). In other cases, these managers are BBAs, MBAs or similarly educated individuals. Typically these school-bred managers will have had a college course or two in programming, systems and the like.

Managers today must schedule and evaluate programs and projects, determine who is to start and continue working in their sections, select and evaluate both hardware and software and be knowledgeable in other general areas pertaining to computers and computing. They must be able to set companywide (or at least departmental) standards, determine the treatment of data and processing security and integrity and see that their systems and programs are satisfactorily structured for backup and compatibility.

Managers must know how to make up proper specifications and review proposals; test systems, programs and operational procedures; and schedule new equipment, new or revised versions of operating systems and new programs and modifications. In addition, they have to know the advantages and disadvantages of in-house computing vs. time-sharing vs. outside processing and the impact of centralized vs. decentralized processing. Frequently, they have to make decisions in areas relating to propagation times, maintainability and reliability.

To properly manage an operation, one must know what goes into making that operation work. A computer room manager should know how to operate the equipment in his computer room, a programming manager should be intimate with programming and a systems manager should have heavy systems experience. Without in-depth knowledge of the areas he is managing, a manager can only make a best guess about what and who is good or bad and what should and shouldn't be done.

A DP manager must certainly be a good manager to do his job. But in addition, a thorough knowledge of DP, obtainable only through actual experience, is a must.

David is vice-president of Systems R&D, Inc., based in Fort Lee, N.J.



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IDMS Gets Link to 'Any' TP Monitor

WELLESLEY, Mass. — A communications interface that lets users run applications based on Cullinane Corp.'s IDMS data base management system under any teleprocessing (TP) monitor without modification is available from that vendor.

Called the Universal Communications Facility (UCF), the software runs with most commercially available TP monitors including IBM's CICS, Turnkey Systems Inc.'s Task/Master, Informatics, Inc.'s Intercomm, Altergo Software, Inc.'s Shadow and Cullinane's IDMS-DC.

UCF, however, can be used with IDMS

only if the data base management system's Central Version (CV) optional support system is also implemented, a Cullinane spokeswoman indicated. CV, a system architecture that reportedly improves IDMS throughput, offers run-unit multithreading capability to allow concurrent run units to continue processing while one run unit awaits a data base I/O.

While Cullinane quotes a \$40,000 license fee for UCF, the ultimate cost will be higher for users who must first purchase IDMS, priced at \$50,000, and the CV option, which costs an additional \$20,000. UCF mainte-

nance after the first year costs 10% of the purchase price.

UCF requests to the data base are handled directly by the IDMS CV in a multithreaded fashion. This, Cullinane claimed, eliminates all interregion communications within the TP monitor except for terminal I/O requests.

Response Time

In addition, the vendor contended that allowing application programs to execute in CV rather than in the TP monitor can lower CPU time by about 20% and quicken response at the terminal, depending on the user application. The spokeswoman noted response time is most improved for multiple requests since they can be handled simultaneously; for single requests, time saved "is not that significant."

To manipulate IDMS data bases and control terminal operations, UCF provides Cobol-like verbs so programmers do not have to learn the programming characteristics of the TP monitor nor design into the system program the interfaces unique to each vendor's monitor, the spokeswoman claimed.

UCF uses less than 10K bytes of memory in addition to the 124K bytes required for IDMS with CV, according to Cullinane.

Offered now for beta test, UCF will be available for general release late in the second quarter, the vendor said from Wellesley Office Park, 20 William St., Wellesley, Mass. 02181.

Manager's Calendar Reporting Added to 'Control/IMS'

SUNNYVALE, Calif. — A reporting facility was added to Boole & Babbage, Inc.'s Control/IMS that allows users to generate monthly reports in a calendar format to compare parameters of IMS activity and use for each day of the month.

With what the firm calls its "manager's calendar reporting system," users of Control/IMS — a measurement and accounting software system for the IBM IMS data base/data communications environment — can generate statistical summaries in the areas of response time, transactions, programs, terminals, data bases, system availability and CPU time.

A batch program, the reporting system produces hard-copy output only in a standard calendar format, a spokesman said. Previously, Control/IMS reports could be generated only in a columnar format.

The calendar reporting system uses about 100K bytes of memory to run and can operate on IBM 370, 30 series or equivalent processors under the SVS, VSI and MVS operating systems.

Even though the use of a calendar format makes the output report easier for management to read and interpret once generated, the spokesman admitted that a systems programmer with IMS background is required to specify, through control cards, the kind of report and comparative data desired.

Seven different reports are included in the calendar reporting facility. A response time report, for example, provides transaction arrival rates and transaction response time.

A transaction report shows the daily transaction profile, indicating peaks and valleys in the transaction load and activity throughout the month, the spokesman said. Daily program load rate and its impact on the system can be analyzed from statistics provided in a program report.

Control/IMS with the calendar reporting costs \$17,000 including documentation and all seven of reports. After the first year, maintenance costs 20% of the then purchase price.

The reporting facility is available free of charge to existing Control/IMS users, Boole & Babbage said from 510 Oakmead Parkway, Sunnyvale, Calif. 94086.

Performance Monitor Runs Under VSE

COLUMBUS, Ohio — A performance monitor for IBM 4300 series systems running the DOS/VSE operating system is available from Goal Systems Corp.

Explore/Discover, introduced in 1978, has been updated to accommodate IBM's changes to the VSE operating system. Now called Explore/Discover Release 3, the monitor can store performance data on disk for future analysis. CPU monitor data, taken at five-minute intervals during a 24-hour period, can be stored on 96 tracks of a 3340 disk drive, Goal said.

A logging and performance analysis fa-

cility has been added to enable users to gather, edit, archive and selectively analyze performance data. The system can produce 29 separate reports through its report-generation program, Goal said.

Explore/Discover Version 3 costs \$110/mo, \$1,200/year and \$3,600 for a permanent license. Maintenance is included in lease and purchase rates, and is provided for three years on purchase. This equivalent to IBM's DOS Performance Tool option requires about 4K bytes of main memory, according to the vendor, which can be reached at P.O. Box 29481, Columbus, Ohio 43229.

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MSA Enhances Package With Lease Accounting

ATLANTA — Management Science America, Inc. (MSA) recently revised its Fixed Assets Accounting System to comply with Financial Accounting Standards Board 13 standards, which require accountants to categorize leases.

Also included in the revision are group/composite tax calculations, increased standard reporting capabilities and a special report generator, the firm said.

With Release 5.0, users can enter payment information and other lease information and the package will automatically determine whether a given lease is a capital lease or an operating lease. The system also provides the required disclosure information and journal entries for recording interest and amortization, MSA said.

Tax accounting under Release 5.0 includes calculation by item, group, composite and vintage using any accepted depreciation method and first-year convention. The package complies with Internal Revenue Service report regulations, according to MSA.

'UFO' Updated For CICS Users

HASBROUCK HEIGHTS, N.J. — IBM 3270 large-screen support plus the ability to dynamically modify screen attributes and content were added to Oxford Software Corp.'s Users Files On-Line (UFO) interactive CICS transaction system.

Release 2.1 of UFO also provides phonetic search capabilities that don't require changes to user files, a spokesman said. In addition, users reportedly gain enhanced support for Cincom Systems, Inc.'s Total data base management system; the new UFO version requires less code to access data in Total.

This latest release uses the same amount of memory — 160K bytes — as the earlier UFO 2.0. UFO runs under DOS/V5, DOS/VSE and OS/V5 systems that use CICS/V5.

Prices depend on whether the DOS or OS version is used, with or without a data base interface. Purchased packages cost \$15,000 to \$22,500; leases cost between \$500/mo and \$750/mo, including maintenance.

Oxford is at 174 Boulevard J, Hasbrouck Heights, N.J. 07604.

Software Institute Sets CPU Power Workshop

PALO ALTO, Calif. — The Institute for Software Engineering will sponsor a workshop on CPU power at the San Francisco Kyoto Inn March 11-13.

The workshop will feature a discussion of the institute's CPU Power Calibration Instrument (CPCI) software package, which measures relative CPU power on large-scale IBM-compatible processors, ISE said.

The workshop will also provide a basic introduction to IBM and IBM-compatible processor architecture, ISE added.

The course costs \$300 for institute members and \$470 for nonmembers. ISE can be reached at P.O. Box 637, Palo Alto, Calif. 94302.

Release 5.0 includes sequence, frequency, summary or detail standard reports.

User-selected parameters let the user define report headings, required totals, selected criteria, report format, data and arithmetic calculations, the vendor said.

Release 5.0 costs between \$22,000 and \$29,000, depending on the user's hardware and data base management system. It is available for IBM 360 or 370 series CPUs running DOS, OS, MVS and CMS as well as IBM 30 series CPUs and Burroughs Corp. B2700 and B3500 CPUs under MCP, MSA said from 3445 Peachtree Road N.E., Atlanta, Ga. 30326.

DBMS Now Works on PDP-11

NEW YORK — Small Business Machines, Inc. (SBM) has released Version 4.0 of its Simile data base management system (DBMS) for Digital Equipment Corp. RT-11 and RSX-11-M operating systems on all DEC PDP-11 minicomputers.

The release adds the ability to transfer information to one or more fields within the data base regardless of the type specification of that field. Real, integer or alphanumeric data can be transmitted.

If real numbers are transferred to an integer field, the decimal portion of the number will be truncated. Alphanumeric data will either be in-coded or decoded, according to SBM.

Also added to Simile are Boolean

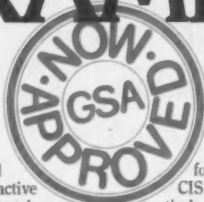
functions that will allow the user to retrieve data on a conditional basis.

Version 4.0 provides for logic/branching, data base-independent storage and lock features on global (multiple user) registers.

Simile can be used to define and edit data base schemata, as well as to enter, change and validate and display information in an interactive format or through tailored formatted menu-driven screens, SBM said.

Simile features a report writer and an English-like command language. It costs \$2,500 for RT-11 users and \$6,500 for RSX-11-M users. The package requires 64K bytes of main memory, the vendor said from Suite 717, 370 Seventh Ave., New York, N.Y. 10001.

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The Compact compiler runs on 32K byte microcomputer systems. Its powerful subset includes full support for random, indexed and sequential files.

Or choose the Standard Compiler.

The Standard CIS COBOL compiler requires a minimum 48K of user RAM. A super-set of the Compact compiler, implementing ANSI 74 COBOL to Federal Low-intermediate Level.

The same CIS COBOL extensions for conversational working, screen control, interactive debugging, and special peripheral support are in both compilers. And there are more reasons to consider CIS COBOL:

- It conforms fully to the ANSI '74 standard, so programs are portable upwards and downwards to minis or mainframes.
- Its interactive features enable main-frame programmers to get results fast... working on inexpensive microcomputers.

Forms

The FORMS utility lets you build a screen layout online at the CRT. Then it automatically generates COBOL record descriptions for inclusion in your program.

Forms-2

A superset of FORMS, it eliminates the need to write simple data entry and inquiry programs, because the programs can be automatically generated from screen definitions.

Environment

CIS COBOL products run on the 8080 or Z80 microprocessors under the CP/M® operating system, and on the LSI-11 or PDP-11 processors under RT-11. They are distributed in a variety of disk formats and come with a utility that enables you to use any make of CRT.

OEMs

Intel has adopted CIS COBOL and offers it as iCIS-COBOL for their Intellect and

Intellect II systems. Ideal for OEM's or private label, CIS COBOL was developed entirely by Micro Focus. Send inquiries for CIS COBOL object packs and application vendor terms to MICRO FOCUS or its licensed distributors. Distributor terms also available from MICRO FOCUS.

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Auditing Package Powers State Utility Management

By Skip Jones
Special to CW

BOSTON — Boston Edison Co., an investor-owned utility in Massachusetts, obtained the Audit Analyzer from Program Products, Inc. in October 1978. Since that time, the package has paid for itself in both time and money, particularly in several key auditing systems. This savings was significant in our "flux analysis" system, which was originally handled manually by external auditors.

Now that the flux analysis system is backed up by the Audit Analyzer, reports are run comparing the trial balances in different time periods on an account basis.

In addition, within each trial balance, specific types of balances such as accounts receivable can be checked, any differences noted and the percentage of these differences calculated.

All balance data is then printed for several different accounts, each of which has a series of reports produced. They include:

- A summary report, which provides an analysis of various account balances.
- A report showing complete account detail, for example, what makes up the entire balance of a summary report.
- An analysis of clearing accounts.
- Accounting ratio reports. The information from these reports are spun off on disk files. The Audit Analyzer uses this information to make bar graphs that show a history analysis of particular ratios. These bar graphs

Library Utility Supports DOS

SANTA CLARA, Calif. — IBM DOS and DOS/VS users can list, summarize and cross-reference job control language (JCL) statements from system or private source statement libraries. Control statements can also be listed from the DOS/VS procedure library with a software product from Software Assistance here.

Called PROCXREF, the product is a report utility for JCL, cataloged procedures and source statement library members. PROCXREF produces a detailed listing of all procedures selected and some cross-referenced reports for the different types of JCL statements contained in those procedures, the vendor said.

The listing is a report of the entire contents of all procedures selected in a "two-up" format, which allows multiple procedures per page. Cross-references are created for phase names, file names and file identifications from both TLBL and DLBL statements and EXTENT information, the vendor said.

The package is directed by control cards or UPSI settings. Run time options include the source of input statements, the procedures to be selected and the types of reports and cross-references desired.

PROCXREF is distributed on magnetic tape and costs \$1,000, according to the vendor, which can be reached at P.O. Box 2101, Santa Clara, Calif. 95051.

represent all accounting ratios for different periods.

Normally, the figures and percentages in a flux analysis should be close. If not, management knows immediately that a discrepancy exists and corrective action must be taken. The Audit Analyzer assists management in this regard by providing all data in an organized, detailed and current manner.

In my experience as a DP auditor, I've found that any kind of analysis can be done using the various logic points which provide entry to the system.

Jones is a senior DP auditor at Boston Edison.

Viewdata Bases Built

LONDON — A software package to build data bases for Viewdata systems from a user's existing computer files or at a service bureau is available to U.S. users from Langton Information Systems, Ltd.

Called Preview, the package is said to be a bulk update file that will drive most public and private Viewdata systems. Langton claims Preview bridges Viewdata structures to the user's computer system.

Preview is said to eliminate the need for manual keyboarding and allows the user to implement most large applications in a week's time.

If the first implementation does not satisfy the user's requirements, Preview can be rerun to create a new Viewdata base in a different format,

the vendor said.

Preview will also handle Viewdata structuring tasks, the vendor added.

Preview is a batch system written in Ansi Cobol and assembly. The package requires a minimum of 120K bytes of memory, the vendor said.

Preview will accept a file organization from any make or model of CPU and process that file as serial data, Langton claimed. The package is also said to accommodate variable-length records or records with variable-or fixed-length fields.

The package costs \$20,000, the vendor's U.S. spokesman, British Information Services, said from 845 Third Ave., New York, N.Y. 10022.

"Up and running at



"Peugeot, producing 2.5 million vehicles a year, is now the third largest automobile maker in the world. Domestically, Peugeot needed a comprehensive data base-oriented financial reporting system that could be implemented quickly, with the least amount of impact on data processing and accounting staffs and resources.

"We did not want to 're-invent the wheel', and after a thorough review, we selected Software International's Accounts Payable software package to start. We planned to follow that with their General Ledger a year later, but since Payables went in smoothly in only 60 days, we installed the Ledger six months ahead of schedule.

"In the intensely competitive American automobile market we rely on data processing to help us be as efficient as possible. The combination of Ledger and Payables Systems provide excellent control for U.S. operations, while allowing us to meet special European accounting requirements accurately and thoroughly. In addition, we have greater flexibility to use our data processing skills for problem-solving unique to Peugeot Motors of America."

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State Using DBMS to Back Insurance Claims Processing

By Dave Herb
Special to CW

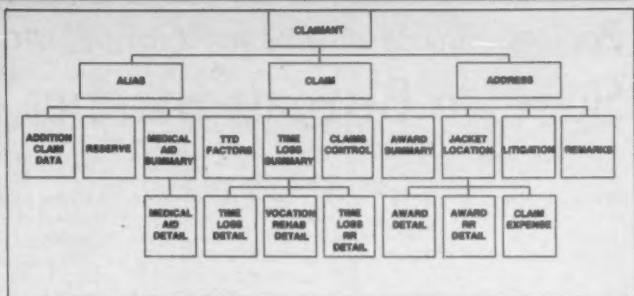
SALEM, Ore. — In a plan to streamline workers' compensation insurance procedures, eliminate complexities and redundancies caused by fragmented files and provide users with increased query capabilities, the State Accident Insurance Fund (Saif) has turned to data base management.

Saif, a state agency here that plans to go public this year, uses the System 2000 data base management system (DBMS) developed by MRI Systems Corp., a subsidiary of Intel Corp., to accomplish its two major tasks of underwriting and claim processing.

By Oregon law, every employer in

the state must provide workers' compensation insurance for its employees — through Saif, a private company or self-insurance. Timeliness is the most critical consideration in the initial acceptance and processing of claims and in their subsequent management. Consequently, the major data base effort so far has been devoted to an on-line claimants system (see chart) which allows Saif to respond more quickly throughout a claim's life cycle.

With data base management, Saif has reduced the time required to move claims into the hands of the people who manage them. When a claim arrives at Saif, the first concern is whether that person has ever filed be-



Saif's On-Line Claimants Data Base System

fore.

Under the previous system, which combined fragmented on-line files and manual operations, the data was organized solely around the claimant's name. This approach often failed to associate the new claim with any existing claimant or claim.

The present system uses the DBMS' multiple keys to provide flexibility in accessing claimants' data. In addition to name, there are now four other keys — firm name, claim number, Social Security number and fonix value — with which a user can search. Fonix value, a Saif-developed feature, identifies variations in names. For example, the entry "William" would pick up "Bill" as well as other variations.

In addition to the multiple-key capability, the DBMS also allows for a search of the files on a non-key data element.

Expanded Data Base

Since first put into production in November, 1978, the claimants data base has grown to 150M bytes. During this time it has not been necessary to reorganize or reload the data base, yet the 2-sec response time has not deteriorated.

Another System 2000 feature, the English-like query language, has helped to improve control over the renewal of an insured's policies. A renewal control data base was developed to track the renewal status of all policies expiring at the end of each quarter. This data base uses the query language extensively.

Another payoff to Saif is that field office personnel now have on-line access to the current status of their accounts. Previously, some of Saif's accounts were lost because the old system could not provide timely information on renewal status. Since the new system has been in operation, there has been an improvement both in renewal ratio and in the retention of key accounts.

One unique aspect of Saif's use of data base management is an interface to Roscoe — an Applied Data Research, Inc. product that acts as a program development tool and has text-editing and prompting capabilities.

When used as an access method for the System 2000, Roscoe prompts the user in a step-by-step manner, building System 2000 DBMS Self-Contained Language (the English-like query and update language) commands or strings. Roscoe then submits these commands to the System 2000 DBMS. In this way, Roscoe functions as a "front end" to the DBMS.

Roscoe's interface with the System 2000 also contributes to data base security by allowing the data base administrator to control user access to system capabilities. For example, if a user were to request a printout of claims for any firm with more than 1,000 claims in the data base, Roscoe would instruct him to submit his request in batch mode because servicing this type of inquiry on-line would significantly degrade the system.

Herb is data base administrator at State Accident Insurance Fund of Salem, Ore.

Peugeot in sixty days."

"There was no need for either accounting or data processing to compromise with either system. Prior to choosing Software International, we surveyed their customers and our 'Big 8' auditors, and were well-satisfied with reliability, field support and system performance.

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Bernard F. Steiner
Treasurer



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Package Cuts Waits for Core Dumps Service Bureau Slashes Debugging Time

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NEW YORK — For most service bureaus, the clock starts turning when the client's software has been designed, tested and entered into production.

Any time lost bringing programs through the lengthy and often tedious tasks of test-

ing and debugging cannot be recovered — nor can any service fees that might have been charged.

No wonder, then, that a pet peeve of Standard Data Corp. (SDC) has been the time wasted waiting for core dumps to be checked in debugging sessions. When the

service bureau heard about an on-line testing and debugging software for Cobol programs, it installed the package for evaluation.

"We didn't put in a big effort to look at any other packages," Executive Vice-President John O'Brien remarked, of Computer Associates' CA-Solve "because I wasn't really ready to change our operating environment."

SDC processes business and financial data for pension, profit-sharing and other employee benefit systems. The firm recently replaced two IBM 360/50s with equal number of 4M-byte Control Data Corp. Omega 480 Model II computers running under DOS-MVT, licensed from Software Pursuits, Inc. SDC has used other Computer Associates software products and, according to O'Brien, found them to "work well" with that operating system.

Benchmark Tests

O'Brien took charge of evaluating CA-Solve and instituted a series of benchmark tests covering 26 programs. The benchmark was conducted over a seven-week period and for each program measured such parameters as number of statements required to develop the program, number of logical errors debugged, actual programmer time spent debugging, number of recompilations necessary and program development turnaround time.

Six programmers participated in the tests, half testing and debugging programs with CA-Solve (Group B) and the other three (Group A) using SDC's conventional batch testing method.

O'Brien described Group A's procedure. Programs written, keypunched and compiled were submitted for test runs. If the job reached the end of the run, the system was instructed to dump output files or perform memory dumps to pinpoint any problems.

In this normal test environment, debugging is controlled by the operating system, which uses a trace feature to print out the various paragraph names executed. Programmers then debug at their desks from this printout, often a "voluminous output," O'Brien explained.

CA-Solve, by comparison, controls program execution at the terminal so programmers can debug on-line without waiting for printouts, he pointed out. Debugging is under the control of the programmer, who can stop the program at the source level by setting a breakpoint at a suspected problem spot.

In this way, the programmer

can check the program before and after the breakpoint by having CA-Solve execute the program line by line.

'Dramatic' Difference

Comparing results obtained by each method showed a "dramatic" difference, according to O'Brien. In seven weeks, Group A, using the conventional method, developed, tested and debugged nine programs. Using CA-Solve, Group B completed 17 programs, 88% more than Group A during the test period.

Further, Group B debugged programs in less than one-fifth the time needed with batch methods and delivered the programs one week sooner than could Group A, O'Brien commented. Group A spent an average of 5.2 days debugging each program compared with Group B's average of .8 day.

The average time needed to complete programs was 2.2 weeks for Group A, 1.2 weeks for Group B.

The CA-Solve group also used fewer statements per program, 607, compared with an average of 620 statements

for Group A. The average number of logical errors found per program during debugging was 5.3 for programmers using CA-Solve, 5.5 for the other group.

Another benefit from CA-Solve, O'Brien noted, was a "decided savings in machine time." Group A required 62 recompilations for the nine programs it produced, while the CA-Solve Group B needed only 24 recompilations for its 17 programs — 61% less for almost twice as many programs.

In addition, Group B's programs required fewer recompilations after clean compilation, 1.4, compared with 6.9 recompilations on the average for Group A. O'Brien admitted, however, that SDC did not examine the number of compiles required for each group to produce a clean program.

CA-Solve appeared also to improve the quality of debugging. Of Group B's 17 programs, only one required additional work while two of the control Group A's nine programs needed further debugging after release to production.

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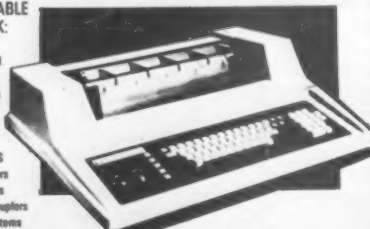
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Oil Explorer Converts to Cobol Without a Spill

Special to CW
MOUNT KISCO, N.Y. — For at least one user, conversion from a Basic-oriented system to Cobol went without a hitch.

When American Ultramar, Ltd., a worldwide gas and oil exploration firm, decided it had outgrown its time-sharing system, company officials realized its DP staff was too small to warrant buying a large minicomputer.

As an interim measure, the firm decided to buy a Wang Laboratories, Inc. WCS/30 mini with a 132 char./sec 2221W printer and a 10M-byte disk drive with telecommunications.

Programmed in Basic, the WCS/30 reduced the time it took American Ultramar to input about 500K bytes of data from several days to about two hours.

According to Thomas R.

Lusby, management information services (MIS) manager, the WCS/30 improved American Ultramar's DP efforts, but the firm outgrew the machine about a year after buying it.

American Ultramar sent proposals to Data General Corp., Digital Equipment Corp., IBM, Burroughs Corp., Honeywell, Inc. and Wang. Lusby said the firm decided Wang's VS mini was the answer.

IBM's System/34 was ruled out because American Ultramar would have been forced to use nonremovable pack disk drives, and backup data was stored on diskette. DEC's PDP-11/36 was also ruled out, Lusby said.

The Wang offered 192K bytes of main memory, one 10M-byte and a 75M-byte disk drive, four CRT workstations and a 220 line/min printer.

American Ultramar ordered a system with four standard languages: Cobol, Basic, RPG-II and assembly. Most of the programs from the WCS/30 were converted to Cobol, but Lusby said at least one application is running in each of the other languages.

"Many of our present applications were either brought over directly from the WCS/30 or converted from time-sharing. Marine accounting and payroll came from the WCS/30.

General Ledger

In addition to converting previously used packages, Ultramar also decided to develop its own general ledger package to handle bookkeeping for American Ultramar and some of its smaller subsidiaries.

"One of the great advantages of installing an accounting package on the VS is our executives can log onto the system and inquire into the status of any account and get as much supporting detail as they need.

"Some of our executives have already developed their own reports using Wang's interactive report-writer facility," Lusby said.

Group Planning

The Wang VS system also plays an important role in developing group planning data. The firm has developed three forecasting packages to handle planning.

Supply and distribution packages generate weekly forecasts of large payables and receivables incurred by American Ultramar's crude oil trading group. On-line editing allows rapid adjustments to changes in crude prices.

A finance package generates a six-month forecast to evaluate proposed operating plans in light of the group's financial resources. Input is obtained from the supply and distribution and cash flow forecasts, Lusby said.

A weekly finance report is generated and circulated to senior company executives. For long-term investments, the firm uses projections on cash flow, expenditures and working capital for American Ultramar and 26 subsidiaries.



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sized to your needs by an automatic paper cutter and page stacker.

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In addition to supporting HP terminals and computers, four different interfaces let you adapt the 7310A to many other terminals and computers. For complete information, including OEM discounts, contact your local Hewlett-Packard sales office or write to Hewlett-Packard, Attn: Bill Fuhrer, 16399 West Bernardo Drive, San Diego, CA 92127; (714) 487-4100.



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George Washington University Schedules Software Courses

WASHINGTON, D.C. — George Washington University recently released a schedule of short courses on software-related subjects.

One course, "Software Quality Assurance: A Management Systems Approach," will teach both program developers and users how to establish a quality control program to eliminate meaningless blocks of software. Participants will be schooled in the process of developing and maintaining both software and firmware.

The course was designed for quality assurance organizations, quality engineers, programming personnel and systems analysts. The course

costs \$460 and runs from March 24-26.

A "Computer-Aided Design/Computer-Aided Manufacturing" course will discuss process planning, parts programming, automated processing, scheduling, quality control, management and distribution. These activities can be integrated through the use of computing systems with significant productivity gains. The course costs \$495 and runs from April 23-25.

Additional information may be obtained from the Director of Continuing Engineering Education, George Washington University, Washington, D.C. 20052.

'Data Model/Ledger' Refit To Run With HP 3000s

SEATTLE — Minicomputer Modeling, Inc. (MMI) has adapted its Data Model/Ledger financial interpreter for Hewlett-Packard Co. 3000 minicomputers.

Programmed in Fortran IV for the HP 3000, the system consists of Data Model for financial modeling and Data Ledger, a financial interpreter, the firm said.

Data Model features include turnkey operation, row and column manipulation, what-if analysis and automatic report generation, the vendor said.

In addition, the package provides financial routines such as amortization, depreciation, present value, internal rate of return, data projection, consoli-

dation, goal seeking, inflation differencing and negative loss carry-forward, MMI said.

Package Features

Data Ledger features include complete audit trail, automatic reporting and a virtual accounting collecting system (VACS) that allows the user to build debit, credit and statistical accounting entries.

Data Model/Ledger is also available in Databus for Datapoint Corp. minicomputers and in Basic for Digital Equipment Corp. PDP-11 and Decsystem-20 minicomputers. It also runs on DEC's VAX-11/780.

The package costs \$16,000 or \$320/mo. Maintenance costs \$160/mo, the vendor said from Suite One, 1222 Lakeview Blvd. East, Seattle, Wash. 98102.

'Tegas4' Runs On DEC Minis

AUSTIN, Texas — A software package for logic simulation and test pattern generation is available from Comprehensive Computing Systems and Services, Inc. The software runs on Digital Equipment Corp. VAX-11/780 and Decsystem-20 computer systems.

Called Tegas4, the software package reportedly enables design engineers to examine initial logic designs and develop tests to determine how well the hardware can operate.

Tegas4 performs four kinds of functions: logic verification, design verification, fault simulation and test generation, a spokesman said. A departmental computer either can be dedicated to Tegas4 or run it with the engineering tasks, he added.

Supplied with the software package is a device library that includes 100 macro models for standard integrated circuits.

Tegas4 licenses for \$150,000 for use with both VAX-11/780 and Decsystem-20 computers, the vendor said from 4105 Tablerock, Austin, Texas 78731.

IBM 5110s Get Text Formatting

BALTIMORE — A text-formatting program for IBM 5110 users is available from Systems Service, Inc.

Features of the 5110/Tex include automatic pagination and page numbering; even and odd page headers and footers; automatic centering and underlining; line widths up to 132 positions; vertical space control for limited overprinting, super- and subscripting; margin control and alignment; chaining or stacking text files; output to files or printer; and user-defined default parameters, a spokesman said.

The program requires a minimum configuration of a 16K-byte IBM 5110 with Basic, one disk drive and printer. Its price is \$600 including a free one-year subscription to Systems Service's Comprehensive Software Service, which contains the latest revision levels and maintenance releases.

Systems Service is at 5617 Carter Ave., Baltimore, Md. 21214.

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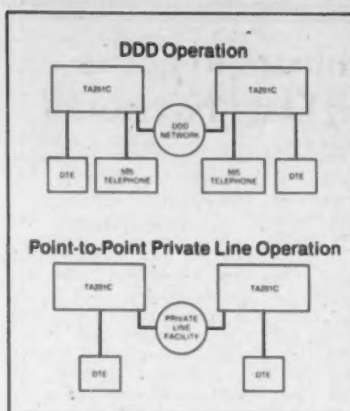
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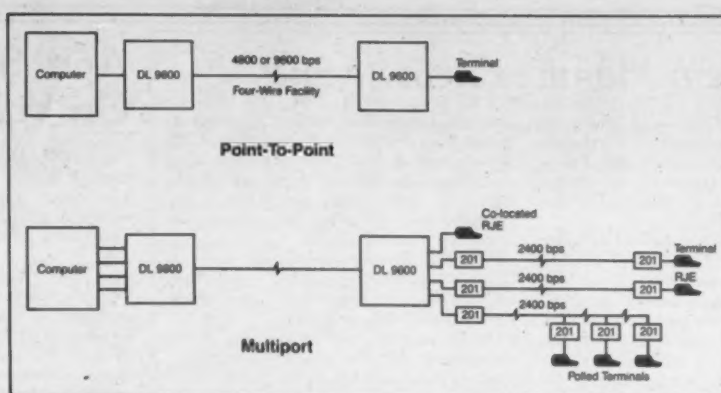
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'Typical' TA201C System Diagrams



Bell 201C, 208A or equivalent lower speed modems can run with Infotron's DL 9600 in configurations such as those shown above.

Private-Line, Multipoint Modems Debut

• Rixon Unit Offers Bell Compatibility

SILVER SPRING, Md. — A Bell-compatible modem that transmits and receives synchronous serial data at 2,400 bit/sec is available from Rixon, Inc.

The TA201C comes in two versions. One model supports two- or four-wire private lines, while the other serves both private lines and the Direct Distance Dialing (DDD) switched network. A "typical" TA201C polled private line configuration is shown above.

The modem comes in a stand-alone, desktop enclosure or as a card data modem. In the latter form, it can be rack-mounted eight across with other Rixon DDD card modems in the vendor's RM40A3 data mounting or rack-mounted eight across as a private-line card modem in the RM40B1A data mounting.

Weighing 5 lb., the stand-alone version measures 5.8 in. wide, 11.4 in. deep and 2.3 in. high, Rixon said.

Features of the modem include an abort timer, transmit timing slaved to the receive timing and an antistream capability that reportedly inhibits the "request to send" signal automatically to remove the streaming terminal from a multipoint system.

The TA201C stand-alone private-line/DDD model costs \$995.

The other stand-alone private-line model goes for \$859, Rixon said from 2120 Industrial Parkway, Silver Spring, Md. 20904.

• Infotron Splits Line Four Ways

CHERRY HILL, N.J. — A band-splitting 9,600 bit/sec modem that reportedly allows the user to combine up to four independent medium-speed channels over a single high-speed line is available from Infotron Systems Corp.

The microprocessor-controlled DL 9600 permits several terminals and/or modems at one location to share a single communications line, Infotron said. As input the unit accepts combinations of 2,400-, 4,800- and 7,200 bit/sec channels.

The "automatic equalization" DL 9600 can withstand line transients lasting up to 2 sec without retraining, the vendor continued. In full-duplex mode, the modem serves point-to-point applications on a four-wire private line at switch-selectable speeds of either 4,800- or 9,600 bit/sec.

All digital filters eliminate the "drift" found on analog units and provide an error rate of less than one bit per one million bits at 9,600 bit/sec on an unconditioned line whose signal-to-noise ratio is 22db, Infotron claimed.

The DL 9600 features self-test diagnostics, 15 front-panel switches and nine LED indicators, one of which registers the occurrence of any telephone line degradation.

The modem costs \$5,500. Optional band-splitting, which can be added in the field, costs another \$1,000, Infotron said from Cherry Hill Industrial Center, Cherry Hill, N.J. 08003.

• Racal-Milgo Suits 'Short' Responses

MIAMI — Multipoint network users have gained a Racal-Milgo, Inc. modem that transmits data from remote sites at 4,800 bit/sec and receives data at 9,600 bit/sec.

At the central site, however, the Model MPS 4896 Fastran modem runs with a receiver designed for 4,800 bit/sec transmissions. The modem is suitable for applications where the bulk of data traffic goes to remote sites and where the responses are "short," according to a spokesman.

Typical users with multipoint networks would be airlines, banks and time-sharing organizations, he added.

Featuring a microprocessor-based digital equalizer, the MPS 4896 reportedly delivers a 30 msec response time and offers half-duplex operation over four-wire dedicated, unconditioned channels. The modem also accommodates dial back-up.

Built-in diagnostic functions automatically switch the modem receiver to the operating speed of the transmitter for self-test, analog and digital loopback. This allows fault isolation testing, Racal-Milgo explained.

The modem can be configured to operate with Racal-Milgo's network diagnostic controllers.

The MPS 4896 comes in table-top or rack-mounted configurations. It costs \$7,200 or can be leased on a three-year plan for \$165/mo.

Racal-Milgo is at 8600 N.W. 41 St., Miami, Fla. 33166.

Infocom Ready At 1,200 Bit/Sec

UPPER SADDLE RIVER, N.J. — Western Union Corp. is offering an enhancement to its Infocom service with the addition of a 1,200 bit/sec channel. Revised tariff rates for Infocom's "refile" service also are now in effect.

The Infocom service provides subscribers with a private communications network for sending a variety of internal messages and data, a Western Union spokesman said. Moreover, the service reportedly allows the user to access Western Union's electronic mail services (for example, Stored Mailgram, which is offered through a subsidiary, Western Union Electronic Mail, Inc.).

With an Infocom terminal, customers can access the carrier's Infomaster store-and-forward message-switching facilities at speeds of 50-, 110-, 300- and now 1,200 bit/sec.

(Continued on Page 54)

Consultant Throws Cold Water On Predictions for Home Nets

By Brad Schultz
CW Staff

WASHINGTON, D.C. — One of the pioneers of network-based home information systems recently had, as he put it, "some cold water to throw" on "rosy" predictions that such systems will prove a huge commercial success in the next few years.

Bill Von Meister, now a consultant with GTE Telenet Communications Corp., did not say success cannot be achieved, but at a conference here he listed what he considers some formidable problems facing promoters of personal data communications — problems that he maintains are seldom recognized despite their significance.

First, there is the problem of determining how information should be transferred from remote data bases to the consumer, Von

Meister noted. While the standard telephone network presently serves as the primary means of such transfers, cable TV and microwave broadcast media are also being considered.

In fact, cable TV already sends data to homes on an experimental basis in Salt Lake City, where Bonneville International Corp. in conjunction with a local TV station displays text on conventional TV sets.

Notwithstanding an optimistic report by Arch Madsen, Bonneville's president, on how that experiment is progressing, Von Meister indicated that cable TV may not be economically feasible as a major alternative to telephone-based home information systems.

(Continued on Page 54)

COMMUNICATIONS

System Monitors Remote Sites

FALLS CHURCH, Va. — A microprocessor-controlled remote system alarm monitor that passes alarm signals over dial-up telephone lines to a remote central site has been introduced by the Pulsecom Division of Harvey Hubbell, Inc.

The Datalok 10D, not to be confused with SPI Data Systems, Inc.'s Datalock data encryption system, operates over dial-up lines to eliminate the need for leasing communications lines to remote sites, its vendor said.

The system can be programmed with two phone numbers of up to 14 digits.

When a 10D registers a major alarm in the

unmanned terminal to which it is connected, it automatically dials a Pulsecom 10 CRT Master Station. The Pulsecom 10 accepts the alarm data collected from one of the 10D's 36 alarm inputs and sends it out through one of its five latched outputs or 10 momentary control outputs.

If the first dialed phone number does not connect, the 10D dials a second number and will try again 20 times before waiting an hour and then dialing again.

The Datalok 10D will be available in the spring for \$1,500. The vendor is at 5714 Columbia Pike, Falls Church, Va. 22041.

April Seminars to Focus On Voice, Data Networks

LOS ANGELES — Two seminars on how to improve data and voice communications networks are planned by the Technology Transfer Institute.

In San Francisco, Dr. Wushow Chou, professor of computer science at North Carolina State University, will discuss "Planning and Managing Teleprocessing Networks" on April 14-16. Chou

will discuss how to plan a cost-effective network for now and for the future.

On East Coast

In New York on those same days, James Jewett and Jacqueline Shrago, co-founders of Telco Research Corp., will address current and future voice communications options in a seminar intended for managers of data and voice networks as well as network designers and analysts.

Registration for each course costs \$675, Technology Transfer said. More information is available from the institute at P.O. Box 49765, Los Angeles, Calif. 90049.

CN '80 Sessions Now Available On Cassette Tape

NEWTON, Mass. — Cassette tape recordings of technical sessions at the recent Communication Networks '80 (CN '80) conference in Washington, D.C., are available from The Conference Co.

More than 60 CN '80 sessions are represented in the firm's catalog. The basic cost is \$6.50 per cassette; however, full coverage of some sessions requires purchase of two cassettes, a spokesman noted.

Any seven cassettes are available for \$39 and any 12 tapes can be purchased for \$65. Those prices include one and two free cassettes, respectively, the spokesman added.

Session Topics

The sessions covered such topics as electronic mail, communications security, the advent of communicating word processors, ways to improve telecommunications management, regulatory aspects of data communications, satellite technology, packet networks and multifunction distributed processing.

Requests for a catalog of the cassettes or orders for proceedings of the conference, which cost \$85, can be sent to The Conference Co. at 60 Austin St., Newton, Mass. 02160.

Guide Covers CRT Displays

PENNSAUKEN, N.J. — A "Management Guide to Identifying, Comparing and Selecting a CRT Display" is available from Alltech Publishing Co.

Costing \$40 (\$35 prepaid), the report can help a manager decide which displays best suit the needs of his firm and what they may cost, Alltech said.

The publisher is located at 212 Cooper Center, North Park Drive and Browning Road, Pennsauken, N.J. 08109.

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	dual intensity		menu set-up	
STATUS LINE	DUAL INTENSITY	CURSOR CTRL	MENU SET-UP	VT-100 OPTION
status line	dual intensity	cursor ctrl	menu set-up	VT-100 option
STATUS LINE		CURSOR CTRL		VT-100 OPTION
status line	underline	cursor ctrl	row & col cntr	VT-100 option
STATUS LINE	UNDERLINE	CURSOR CTRL	ROW & COL CNTR	VT-100 OPTION
	underline		row & col cntr	
132 COLUMNS	UNDERLINE	8 FUNCTION KEYS	ROW & COL CNTR	HALF & FULL DPLX
132 columns	underline	8 function keys	row & col cntr	half & full dplx
132 COLUMNS		8 FUNCTION KEYS		HALF & FULL DPLX
132 columns	blink	8 function keys	current loop	half & full dplx
132 COLUMNS	BLINK	8 FUNCTION KEYS	CURRENT LOOP	HALF & FULL DPLX
	blink		current loop	
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Televideo Unveils Smart Terminals

SANTA CLARA, Calif. — Four smart CRT terminals priced near \$1,000 each are available from Televideo, Inc.

All four microprocessor-controlled models feature upper and lower case character sets, a printer/extension port, an embedded numeric pad, remote computer control, transmission in the 75- to 9,600 bit/sec range and various editing and "special" functions, the vendor said.



The Televideo 920B intelligent terminal has a teletypewriter-style keyboard. Model 920s have 11 special function and six editing keys. The 920C features a typewriter-style keyboard.

Designated the Models 912B, 912C, 920B and 920C, the terminals offer reverse video, underlining, "blink & blank" and key-controllable conversational and block transmission modes. Other features common to the four units include self-test diagnostics, protected fields and functions that support text editing.

The 920 models differ from the 912 models by offering 11 special function keys, six editing keys and two transmission keys — all mounted in an extra row on the keyboard. "B" models feature teletypewriter-style keyboards, while "C" models feature typewriter-style keyboards, Televideo explained.

The terminals' non glare 12-in. diagonal CRTs provide 12 by 12 dot matrix resolution, the vendor continued, and dual intensity for 1,920 char. The full 96-char. Ascii set is reportedly displayed in 24 80-char. rows.

Cursor controls with the four terminals include left,

right, up, down, home, carriage-return, line feed, tab and back tab. With an optional second page of memory, the cursor can address any position in two pages, Televideo stated.

The 912B, 912C, 920B and 920C cost \$875, \$950, \$945 and \$1,030, respectively. The optional second page of memory costs \$80.

Televideo is located at 3190 Coronado Drive, Santa Clara, Calif. 95051.

GE Tapped for Upkeep

SANTA CLARA, Calif. — Users of Televideo, Inc. intelligent terminals can now get ground-the-clock field service for those units from General Electric Co.'s Apparatus Service Division, whose communications service is dispensed from more than 65 U.S. cities.

"Our decision to go with GE came after months of comparing service organizations," a Televideo spokesman said. "Our research has convinced us that GE offers the best value in service for the Televideo user."

Customers may elect a "flat rate" contract or pay by the hour for this service. With a flat rate plan, a single monthly charge covers all preventive maintenance, replacement parts and labor, the spokesman explained.

Televideo is located at 3190 Coronado Drive, Santa Clara, Calif. 95051.

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Comm-Stor Service Added

ROCHESTER, N.Y. — Sykes Datatronics, Inc. has announced that nationwide users of its Comm-Stor family of intelligent terminal products can receive full maintenance and service from Alanthus Data Communications Corp. of Rockville, Md.

According to Sykes, the deal with Alanthus will increase the number of service centers authorized to support Comm-Stor products from 30 to 60. The pact affects the Comm-

Stor II communications storage unit, the Comm-Stor III communicating forms entry station and the Comm-Stor IV programmable mass storage unit.

All service requests from users or distributors will go to Sykes, a spokesman explained, where they will be "screened, processed and dispatched" through the Alanthus service network. Sykes is located at 375 Orchard St., Rochester, N.Y. 14606.



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Consultant Sees Problems With Home Net

(Continued from Page 51)

According to the Telenet consultant, only about 20% of U.S. homes are linked to TV cables. That contrasts sharply with Canada, which has a number of cable TV-based home information experiments under way [CW, Aug. 6].

Roughly 90% of Canadian homes have cable TV, Von Meister stated, so it is much more feasible to base home information systems on cable TV in Canada than in the U.S.

Moreover, many U.S. cable TV links are unsuitable for interactive data communications because they do not allow transmission of data in both directions along the line, Von Meister added. The cost for U.S. consumers to install cable TV is in the range of \$300

to \$600 per house.

"It costs nearly as much to make that cable two-way — because you've got to dig up all the rose bushes, pull the cable out and put the two-way amplifiers in — as it did to install it in the first place," Von Meister said.

From a purely technical standpoint, cable TV may be an efficient means of transferring remote data bases to a limited number of homes, the consultant observed. But the matter of costs is just one reason why cable TV may not prove popular with consumers.

Modification Problem

Another reason is the problem of standardizing TV equipment, Von Meister pointed out. Applied to personal data communications, the TV set

must be modified to serve as terminal.

The modification would be more extensive if interactive capabilities were desired because the TV set would then need a keyboard or voice recognition interface. Similarly, hard-copy capabilities would require a printer interface.

Unless nationwide, if not international, standards are promulgated for these modifications, a home information cable TV terminal that works well in one city may prove useless elsewhere. But TV manufacturers are notoriously resistant to standardization, Von Meister asserted.

Although Von Meister called the nation's telephone network the "most likely" avenue for personal data traffic, he said that present telephone re-

sources would be swamped by the traffic volumes some industry observers anticipate for the consumer sector.

"You need modems," the consultant noted. "Who's going to provide them? What's the investment? Who's going to put out the multiplexers and the concentrators? What kind of saturation and busy-hour problems [will there be]?"

Green Thumb Hit

Von Meister suggested that administrators of the federal government's Green Thumb Project have neglected to consider such questions. Using the staff and facilities of the University of Kentucky, Green Thumb will supposedly culminate in a network that will route weather and agricultural information to farmers through terminals in their homes.

Green Thumb "is going to throw the equivalent of 50,000 erlangs of traffic ... into a rural telephone system that was designed for 5 [erlangs]," the Telenet executive said. As a unit of data traffic intensity, one erlang represents the volume necessary to fully load a single transmission circuit for one hour.

In his critique of developments in home information technology, Von Meister repeatedly cited cost problems as obstacles to getting that technology in most U.S. homes.

Depending on the scope of capabilities desired, the consumer will generally choose between two types of configurations: a terminal facility, which may allow interaction with a remote computer system, or a communicating personal computer which, in addition to offering access to remote data bases and services, would feature a local computing capability.

At present, the cost of this "data machine," whether terminal or computer, is at least \$1,000 to \$1,500, Von Meister noted. As consumer credit tightens, entrepreneurs in the fledgling home information arena may have trouble making those machines as popular as TV sets and hi-fi record players, he concluded.

Infocom Offered At 1,200 Bit/Sec

(Continued from Page 51)

sec, the spokesman explained. Users reportedly can transmit messages to other Infocom terminals on their own private network or "refile" them via Telex, TWX, Mailgram or telegram services throughout the U.S.

Besides the debut of 1,200 bit/sec service, revisions in Infocom's refile rates will result in increased charges for some customers and reductions for others, the spokesman said.

The revised Infocom refile rates are said to reflect differences between 110-, 300- and 1,200 bit/sec speeds by measuring usage in connection with refile traffic in units of one-tenth, one-thirtieth and one-sixtieth of a minute, respectively.

The new rates will also replace geographical rate zones for messages filed from Infocom terminals with a flat charge of \$1.75 per message (for "Fast Message" service) and \$1 per message (for "Overnight Message" service).

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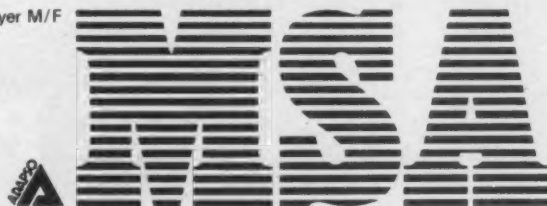
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Key-to-Diskette Terminal Emulates IBM Units

PALO ALTO, Calif. — A key-to-diskette terminal that allows the operator to select from four different IBM communications protocols is available from Tab Products Co.

Tab's System 700 now has a "multiple bisynchronous communications feature" that allows operator selection of IBM's 2780, 3780, 3741 and 2770 protocols as well as block size, transparency and blank compression.

The user can automatically select a protocol and various options at the time of order, Tab said. Those selections can be overridden manually to select alternatives.

The terminal feature can be added to either the single- or dual-station System 700. It comes with a communications interface that reportedly attaches

to either a modem or "most" computer systems directly, Tab said. This permits transmissions up to 9,600 bit/sec.

The single-station System 700 with

the multiple bisynchronous communications feature but without a printer is available for \$184/mo, excluding maintenance. The purchase price of a

single-station system is \$6,750; a dual-station system costs \$7,300.

The vendor is located at 1451 California Ave., Palo Alto, Calif. 94303.

Pacific Telecommunications Council Forms

HONOLULU — An organization of Pacific region telecommunications users, researchers and suppliers is now functioning here as a result of the recent Pacific Telecommunications Conference held at the University of Hawaii.

The Pacific Telecommunications Council (PTC) is a voluntary, independent organization "established to meet a growing need for the beneficial use, development and understanding of tel-

ecomunications in the Pacific area," according to PTC Director Richard J. Barber, who is also a University of Hawaii professor.

PTC "intends to attract membership and support from industry, telecommunications carriers, users, academia and other entities" based in countries with Pacific shorelines, Barber announced. The group "will provide a forum for an ongoing exchange of ideas and information for the better-

ment of the Pacific-area countries through telecommunications."

Besides Barber, the council's board of trustees includes, as board chairman, Jorge Kanahauti, vice-president of Televisa S.A.; finance vice-chairman, Robert M. Englehardt, Hawaiian Telephone Co.'s director of international and business relations; research vice-chairman, Nozomu Takasaki, director of the Research Institute of Telecommunications and Economics; and external relations vice-chairman, George Lissandrello, IBM World Trade Corp.'s manager for telecommunications and standards relations.

Problem of Cost

According to Barber, the 1980 Pacific Telecommunications Conference discussed how the developing nations of Asia, the Pacific islands and Latin America need communications circuits, but cannot necessarily afford them. "Despite the technical advantages of submarine cables in data carriage," Barber stated, "satellites present the most economically attractive approach to meeting those nations' needs."

"However," the professor continued, "present schemes favor low-powered satellites serving large, high-volume users with expensive earth stations."

"Few Pacific countries can afford such an investment," he said. "Indonesia has a national priority for a domestic satellite which it will eventually share with its neighbors."

"Following the 1979 World Administrative Radio Conference [Warc] in Geneva, several [conference] participants who had been delegates from their respective countries commented on the results. They tended to agree that there will be more sharing arrangements."

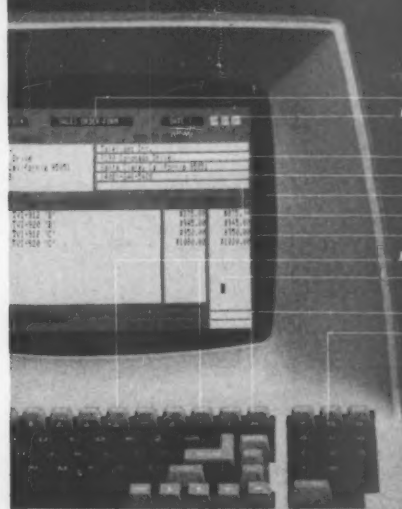
"To guarantee access to geostationary orbit space, high-frequency and other high-demand services," Barber theorized, "there may be a return to the 'international engineering' approach of the 1950s."

During that time, frequency tables were modified to permit expansion in some bands, such as satellite services, and more intensive use of others, including mobile radio, the professor explained.

Copies of the conference's proceedings are available for \$45 (U.S.) prepaid from Barber at 2424 Maile Way, No. 719, Honolulu, Hawaii 96822.

The PTC's 1981 conference will be held in Honolulu on Jan. 12-14.

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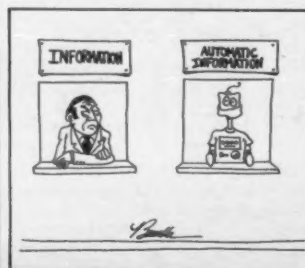
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Saves \$17,000/Mo Telephone System Pays for Itself in One Year

By a CW Staff Writer
BOSTON — A major engineering and design firm here saved so much money as a result of installing a telephone switching system that it was able to pay off the system in about one year.

Stone & Webster Engineering Corp. formerly employed eight operators to process and ticket 50% of its outgoing toll calls. The rest of the calls were dialed directly by the extension users; the direct-dial calls had to be identified and distributed to the proper account at a later date.

The firm now employs only three operators, and the entire calling system is automated, saving the company 35% —

more than \$17,000/mo, according to Dean Malenfant, manager of Stone & Webster's Information Systems and Facilities Group.

Faced with a move to a new facility in 1974, the firm began searching for a computerized telephone management system that would provide the benefits of least cost routing and, more importantly, a more efficient method of distributing costs.

The firm also needed a system that could automatically identify the station from which the call was being placed and automatically accept a charge number.

A Datapoint Corp. Infoswitch/Share system was first evaluated in October

1977; Stone & Webster decided to acquire it in April 1978. It was installed five months later.

The Infoswitch system consists of a host processor, disk system, printer and, in this firm's case, an intelligent switching subsystem (referred to as LDCS) and two intelligent call metering systems (SMDR). The LDCS is used to control long distance costs, and the two SMDRs record calls according to charge number in order to distribute costs among the firm's various branches.

Easier to Handle

To place a call, a user enters a seven-digit code to identify the accounts to

be billed and then dials the standard phone number. Stone & Webster felt that though it involves dialing a few more digits, the account procedure was considerably easier to handle than the manually kept call logs and verification procedures used previously.

All call information is transferred to Stone & Webster's Treasury Division, which bills the calls to various divisions.

Before installing the Infoswitch system, "we had a significant amount of Direct Distance Dialing [DDD], which was expensive. Now, only international calls are allowed to go DDD, even at night," Malenfant said.

The firm had been spending an average of \$50,000/mo for approximately 22,000 calls. Half of the calls were DDD, while the other half were placed on Stone & Webster's 18 Wats lines.

"It would be hard to dislike something that is saving you \$17,000 a month," Malenfant said. "Top management likes it and so do the people that use it every day, which I think is also an important factor."

Installation went "relatively smoothly," which the firm considers partly attributable to the fact that the it was prepared. The building was wired for the new system, and the firm was able to "cut over" to Infoswitch in a week-end.

Teething Problems

In the following two weeks, the company encountered some teething problems; notably, there was a problem in matching up the phone being used with the identity of the caller. The equipment erred by indicating a blank instead of the identifying number of the caller.

After transferring between the old and new system for a week and a half, the firm eliminated most of the quirks. The system now "works well for Stone and Webster," Malenfant said.

He added that one reason the system has been so successful is that the firm "thoroughly investigated" its own needs and chose the company that could best fill them.

"Once you have decided what is right for you, get totally ready for the installation. Make sure the site of the installation meets all requirements. This is particularly important if you have not experienced computer-related installations previously," Malenfant advised.

The computerized aspect of the telephone setup faded from most users' perspective after a few weeks. "We are reminded that things have changed only at the end of the month, when we see savings that amount to thousands of dollars and telecommunications bills that can be distributed in a matter of hours," Malenfant said.

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Two-Port Intelligent Multiplexer Bows

CHAMPAIGN, Ill. — A two-port intelligent multiplexer that reportedly offers 10% to 50% more efficient data transfer than statistical multiplexers has been introduced by Compre

Comm, Inc.

The Data Express DE-2 concentrates two asynchronous terminals or synchronous modems operating at speeds up to 9,600 bit/sec. It uses an "ad-

ressed character block" transmission said to propagate data faster than the character time slot of time-division multiplexers and "much faster" than statistical multiplexers using the X.25 or IBM's Synchronous Data Link Control protocol.

The higher performance claimed by the maker can be used to fullest effect with terminals running full-duplex. The DE-2 uses a buffer to support error correction and to allow terminals' data rates to temporarily exceed the modem composite speed, Compre Comm said.

Diagnostics show the status of the communications link, and a loop test mode allows data to be looped from the terminal — through the multiplexer — and back, according to Compre Comm.

The DE-2 uses an RS-232C interface. The synchronous unit costs \$1,350; with an asynchronous composite option, it costs \$1,450, Compre Comm said from 51 E. Chester, Champaign, Ill. 61820.

GA Introduces Teleprinter

ANAHEIM, Calif. — A teleprinter that runs in half- or full-duplex mode at 10- or 30 char./sec and communicates with a host CPU at 300 bit/sec is available from General Automation, Inc.

The Model 3365 printer is optionally available in receive-only and keyboards send/receive versions. Its matrix print head will generate 200 million characters before expiring, GA claimed.

The teleprinter's pinfeed employs a 132-char./line that gives 13 char./in. on 12- by 8.5-in. fanfold paper. Serated margins allow the paper to be stored in a reproducible 11- by 8.5-in. format, GA added.

Featuring self-test software, the GA 3365 teleprinter supplants the vendor's 3362 and 3363 teletype-writers and costs \$2,075.

GA is at 1055 South East St., Anaheim, Calif. 92803.

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OW-80

Megadata Adds Programmable CRT Terminal

BOHEMIA, N.Y. — A terminal featuring 8K bytes of programmable read-only memory, and either 4K or 16K bytes of main memory is available from Megadata Corp.

The Model 850 allows the user to automatically dial up the host computer system or to automatically call the terminal by telephone, Megadata said.

A separate control loop enables the terminal to assume the receive functions of a Telex machine, and a one-line status area notes the arrival of important messages as well as the terminal's status.

A 15-in. screen displays 25 80-char. lines, Megadata noted. As an option, the terminal also features 4,000 bits of electronically alterable read-only memory, which the user can erase by key or computer command.

The Model 850 was developed specifically for applications that require a satellite CRT terminal capable of performing intelligent, stand-alone functions, Megadata stated. A standard receive and transmit RS-232C interface is included.

The terminal costs \$1,500 in quantities of 500 or more. Megadata is at 35 Orville Drive, Bohemia, N.Y. 11716.

Error Controller Fits 1,200 Bit/Sec Modems

CHATSWORTH, Calif. — The latest member of Micom Systems, Inc.'s Micro 500 family of error controllers is said to ensure error-free transmission for asynchronous dial-up terminals operating full-duplex at 1,200 bit/sec.

The Model 512 error controller performs error-checking and automatic retransmission-on-error functions without requiring any changes to existing hardware or software, Micom claimed. The device was designed to run in a time-sharing environment with Bell 212 or Racal-Vadic, Inc.'s VA3400 modems.

The Model 512 costs \$895, Micom said from 9551 Irondale Ave., Chatsworth, Calif. 91311.

DEC VT-52 Emulated

PHILADELPHIA — A Digital Equipment Corp. VT-52-compatible terminal is available from Human Designed Systems, Inc. The terminal is offered with multiple I/O ports for printers and other devices.

On this terminal, the Concept 520, users can emulate the standard features of the VT-52 plus additional features that include programmable function keys and support for word processing and data entry.

The terminal can be ordered with one to four full pages of display memory in either Ascii or APL versions. A Concept 520 with one page of display memory and Ascii coding costs \$1,675, the vendor said from 3700 Market St., Philadelphia, Pa. 19104.

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Not So Powerful, Researcher Says Tests Dispute 4341 Performance Claims

By Tom Henkel
CW Staff

SAN JOSE, Calif. — Although IBM's 4341 mainframe may look like a relatively powerful machine, a market research firm here claimed that tests showed the 4341's "elapsed time" — runtime — throughput is not as impressive as "raw CPU power" figures from IBM.

According to IBM, the 4341 is 22 to 34 times more powerful than a 370/115-0. However, Strategic Business Services, Inc. said that in its "elapsed time [tests,] the performance advantage [was] reduced to a factor of only 6.8 to 10.7 times greater than a 370/115-0.

The benchmark tests were based on a "standard work load" of three performance tests. Those tests included a set of seven batch jobs, to determine internal performance; an on-line transaction-oriented, CICS-based benchmark; and an interactive benchmark based on a collection of simulated users doing various types of work under VM.

Batch results were compared with similar tests conducted on various 370 models. On-line results are expressed in terms of message/min handled. The interactive benchmarks detail response times found in environments simulating 20 simultaneous users, Strategic Business Services said.

'Surprising' Results

The benchmark tests took into account different virtual memory configurations, but even with those considerations, "the impact of changes in batch partitioning upon multi-programming effectiveness is surprising," the researcher said. "In certain instances, where increased effectiveness was expected, there were instead increases in elapsed time."

After running the benchmarks, Strategic Business Services evaluated the performance of both 4331s and 4341s in an interactive mode. Based on locally attached IBM 3270 CRT terminals simulated under "scripts" that represented seven different hypothetical users, Strategic Business Services determined that a 4331 in a 14-terminal environment has an average response time of 2.7 sec. In a 16-terminal system, the response time is 2.8 sec; 18 terminals, 3.2 sec; and 20 terminals, 3.3 sec.

On a simulated 20-terminal configuration, Strategic Business Services evaluated re-

sponse time with and without the Extended Control Program Support/Virtual Machine (ECPS/VM) option. That package, IBM said, reduces the time necessary to execute frequently used functions.

Without ECPS/VM, the response time was .35 sec compared with .26 sec with ECPS/VM, according to Strategic Business Services.

Strategic Business Services also evaluated the on-line transaction-processing capabilities of both the 4341 and 4331. Using IBM's Teleprocessing Network Simulator, both

CPUs were tested to see how much performance users could expect from a 40-terminal system served by a CICS partition with two communications lines and four cluster controllers.

The 4331 was evaluated for both medium and heavy CICS use. With medium CICS use, the average response time was 3 sec. However, in heavy CICS environments, that figure more than doubled to an average response time of 6.2 sec, according to Strategic Business Services.

(Continued on Page 64)

Mass Storage System Expands Disk Capacity of VAX by 50%

By Jeffrey Beeler

CW West Coast Bureau

SUNNYVALE, Calif. — Users of the Digital Equipment Corp. VAX-11/780 reportedly can expand their maximum disk capacity by 50% with a mass storage system recently introduced by System Industries, Inc. (SI) here.

The system incorporates a Control Data Corp. Model 9766 disk unit that stores 300M byte/spindle, the largest external memory capacity yet offered with VAX-11/780 configurations, according to an SI spokesman.

Previously, the largest disk unit available with VAX systems was DEC's RH780, which the SI product was designed to replace. The RH780 stores 200M byte/spindle.

As many as eight of the CDC disk units can be linked to a VAX system in a daisy-chain configuration for a total of up to 2.4G bytes of on-line storage, the spokesman said. That capacity compares with 1.6G bytes for the largest possible configuration of RH780s.

The SI product's increased storage capacity reportedly makes it unsuitable for banks, printing and graphics firms, service bureaus, insurance companies and other users that require large, on-line data bases.

Among its other main performance advantages, the SI system offers an average access of 30 msec, compared with 36 msec for the RH780, the spokesman said.

In addition to the CDC 9766 disk unit, the SI system incorporates an SI Model 9400

controller and a synchronous backplane interconnect (SBI) adapter that interfaces the controller to the VAX-11/780 processor. The SBI adapter — which comes with backplane, card cage and cables — consists basically of four printed circuit boards that occupy about as much CPU chassis space as the RH780.

Multiple-CPU Connection

As an option, the SI system reportedly allows VAX-11/780 users to connect their CPU through the 9400 controller to any combination of three other 11/780, PDP-11/34 or PDP-11/70 processors.

This multiple-CPU-connection capability helps guard against processing interruptions by providing redundant routes to each of a system's disk units. Thus, if one of a system's controllers breaks down, its associated disk unit will remain accessible because it can still be addressed through alternative controllers, the spokesman explained.

Capable of emulating both the RH780 hardware and DEC's RM03 software at the operating system level, the SI system transfers 1.2M byte/sec and provides a track-to-track access of 7 msec. The system also stores 6,000 bit/in. with MFM recording techniques, the spokesman said.

An SI mass storage system with one 300M-byte disk unit costs \$36,500. Add-on units are available for an additional \$17,400 each. The multiple-CPU-connection option increases the system's list price another \$11,000, SI said from 525 Oakmead Parkway, Sunnyvale, Calif. 94086.

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According to U.S. vs. IBM Testimony IBM to Test 4,000-Circuit Josephson Prototype

By Connie Winkler

CW Staff

NEW YORK — IBM's Research Division this year will test the cycle time of logic chips designed for a 4,000-circuit prototype Josephson junction technology computer. Currently the Josephson logic chips operate in the enormously fast 35- to 40-psec range, Dr. Ralph E. Gomory, head of IBM's Research Division, said recently.

That 4,000-circuit prototype might lead to a Josephson computer the size of a 1- to 2-in. cube and with a projected cycle time of 2.5 nsec, or 80 times faster than IBM's 370/168, Gomory said in testimony in the U.S. vs.

IBM antitrust trial here.

"I would still say that it is a very high-risk technology, but I do think it's the only technology of which I, at least, am aware that has the possibility of outperforming the silicon technology," Gomory said about Josephson research during his four days on the stand.

A nanosecond, or one billionth of a second, is about the switching time of a very fast bipolar circuit today. A picosecond is one-thousandth of a nanosecond, or one-trillionth of a second.

IBM Work

IBM began the Josephson technology work about 1974, Gomory said, and

today has a working logic family, or the ability to make AND and OR fully loaded circuits. Testing these circuits in a package configuration is the 1980 step.

Josephson technology uses the physics phenomenon of superconductivity where electrons flow through a wire of the right kind of metal in the right way at very low temperatures — several hundred degrees below 0°C.

Brian Josephson, in Nobel Prize-winning work, predicted that introducing a magnetic field would allow a turn-off/turn-on of these electrons. Low resistance, low power and very rapid turn-off are potential keys to a high-speed computer, Gomory ex-

plained.

The CPU would necessarily have to be very small and compact because, if spread out, the signals would take too long to get from one part of the CPU to the other, Gomory said.

The Josephson work would be a big leap in miniaturization, which has marked the computer industry. Miniaturization has been the best avenue to cut costs and improve performance of computers and, particularly, semiconductors, the Ph.D. mathematician said.

Gomory told of other research areas in which IBM is working: optical fibers, particularly for communications; magnetic bubble memories; laser liquid crystal displays; and continuous speech and handwriting recognition by computer.

He attributed present breakthroughs in computer technology to the great progress in logic and memory performance at decreased costs and to improved mathematical algorithms. "One way to make the hardware go faster is to make the hardware work with less steps," the IBM vice-president said.

Because cross-examination covered unannounced IBM products, much testimony was in "in camera" sessions behind closed doors.

Flip-Chart Presentation

One document that government lawyer John H. Chapman introduced in open court appeared to be a flip-chart presentation which said: "We are now followers in technology (except E-beam)."

Although the document was undated and unsigned, Chapman tried to relate it to the formation of a Semiconductor Sciences and Technology Department within the Research Division in 1978. Such a move, the presentation suggested, would be "impetus for more innovative and exploratory applied work."

Gomory, who has headed the Research Division since 1970, disagreed with the document. In response to one statement that IBM semiconductor physics "has fallen behind," Gomory said, "I think that is quite false." In the same document, Gomory also pointed out that Leo Esaki, an IBM employee, won the Nobel Prize for his semiconductor work. Chapman objected that Esaki did the Nobel Prize-winning work before joining IBM.

Justice Allegations

The Justice Department has tried to show that IBM draws upon the research work of others, and Chapman introduced a document listing 80 consultants, mostly associated with universities, whom IBM used in 1975 and 1976.

Gomory did agree with Chapman's definition of an invention. The Justice Department has regularly fought IBM's efforts to have its employees referred to as inventors.

"You build on the work of others," Gomory said. "I don't think [the term 'inventor'] is very meaningful... people overemphasize individual contributions."

Gomory is generally recognized as the first to write an integer programming algorithm.



Solid engineering and 340 lpm speed make the TermiNet 340 a more rugged, productive line printer.

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ronments needed to keep working.

More reasons: print and ribbon systems that won't wear out prematurely and won't cause the problems other line printers do. Which is why the proven rotating-belt print system will last billions of characters. And why the ribbon cartridge will maintain very high print quality for at least 100 million characters.

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The fact is, TermiNet 340 line printers are such productive workers, they require very little attention and very little maintenance once they're up and running. Should service be needed, you can count on getting these printers back on-line in a hurry. That's because of convenient self-test features that make troubleshooting easy and fast. And because of a responsive nationwide service network that keeps downtime to a minimum and operating costs low.

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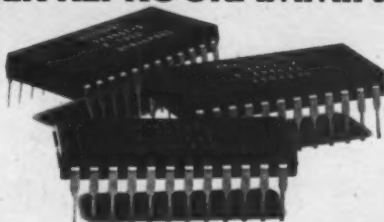
We have only two models, the ADM-31 and the ADM-42, in our line of smart terminals. But they can handle applications other manufacturers need an arsenal of terminals to accomplish.

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And, if you run into problems our special Applications Engineering Staff will help you through any difficulties with reprogramming, interfacing, setting the terminal's personality, special applications, or understanding the features and functions.

THE ADM-31 AND ADM-42. TWO TERMINALS, DOZENS OF FEATURES.

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Both terminals include the latest in microprocessor technology. So both are reliable and, most importantly, easier to use.

Don't worry, we didn't forget to put function keys on either terminal.

With the ADM-42, for example, you get 16 function keys, shiftable to 32 functions and optionally programmable to store up to 64 characters per key.

SMART TERMINALS. SMART CHOICES.

So there you have it. Two very good reasons why you only need to look at two very smart terminals.

Sound interesting? Then call or write us at Lear Siegler, Inc./Data Products Division, 714 North Brookhurst Street, Anaheim, California 92803, (800) 854-3805. We'll tell all you want to know about the ADM-31 and ADM-42.

And then you'll see why your search for the right smart terminal just ended.



LEAR SIEGLER, INC.
DATA PRODUCTS DIVISION

Printer/Plotter Features 'Quadrascan' Writing Head

MOUNTAIN VIEW, Calif. — A printer/plotter with four offset rows of writing-head stylii rather than the usual one or two has been announced by Benson-Varian, Inc.

The 36-in.-wide Model 9236, featuring the so-called "Quadrascan" writing head, prints at speeds up to 370 line/min and plots at 1 in./sec. It can reportedly complete a 15-sq-ft plot in 60 sec.

In operation, each dot appearing on the paper overlaps adjacent dots approximately 50%, more than five times that of conventional writing heads, a spokesman claimed.

The latest addition to the Benson-Varian Series 9000 line of electro-

static printer/plotters also gives 37 applications of toner to every charge on the paper, the spokesman said.

Other features include a standard hardware character generator and paper supply monitor.

Available options include a "quick-look" capability, ability to obtain 100 dot/in. plot requiring only 25% of the data for a full plot and a controller that converts sorted or unsorted vector data into raster format.

The Model 9236 costs \$35,900 from Benson-Varian, 385 Rivedale Drive, Mountain View, Calif. 94043.

Calcomp Cuts Price Tags Of Drum Plotter, Controller

ANAHEIM, Calif. — Price reductions for California Computer Products, Inc.'s Model 1012 desk top drum plotter and the Model 907 on-line controller have been announced by the firm.

Effective immediately, the 1012's price is \$6,700, down from \$7,700, while the 907's price has been reduced \$500 to \$4,560 because manufacturing costs were below original estimates, a Calcomp spokesman said.

Operating as an intelligent interface, the Model 907 accepts data in serial RS-232C, 20ma current-loop, IEEE parallel and selected other parallel formats.

Up to 288 characters and symbols, including a 95-char. Ascii set, foreign

characters and special symbols, are stored in its read-only memory, the spokesman said.

User Defined Characters

Up to 192 user-defined characters can be downloaded from the host computer to the random-access memory, he added, and on-line buffers may be configured from two buffers of 1K byte to 16 buffers of 128 bytes each.

The Model 1012 plotter, designed for remote and time-sharing applications, has four pens and uses fanfolded 11-in. paper. It is said to plot at speeds up to 10 in./sec, with a resolution of .05mm.

Calcomp is located at 2411 West La Palma Ave., Anaheim, Calif. 92801.

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Tests Dispute Claims for 4341

(Continued from Page 61)

An 80-terminal, 2M-byte 4341 with eight spindles of 3330-1 disk storage on two channels running the DOS/VSE Release 34 operating system was tested on simulated constant CICS usage. The average response time in that test was found to be 1.9 sec.

A Strategic Business Services spokesman could not explain why the 4341 was tested in a DOS/VSE environment. Performance of the system theoretically should be enhanced if DOS/VSE — the operating system released by IBM for the 4300 line — were used.

Survey: Users Happy

In addition to testing the two systems, Strategic Business Services also conducted a survey of an undetermined number of 4331 users. The survey results suggested that 4331 users are generally pleased with the overall performance of their CPUs.

However, the surveyed users referred to several problem areas with the 4331. They complained of problems with IBM 3340 disk drives and 8809 tape drives when used in conjunction with a 4331, Strategic Business Services said.

In addition, the users said they do not like the requirement that they take IBM's Interactive Computer Control Facility (ICCF) in order to use IBM's software maintenance and Sysgen routines, known as the Installation Productivity Option/Extended (IPO/E). They would prefer to use the equivalent of ICCF supplied by other vendors, they told the pollsters.

Leery of Others

But even though they want other vendors' version of ICCF, 4331 users are leery of other vendors' software. The survey indicated users are concerned that non-IBM software might not hold up through future releases of DOS/VSE, a spokesman said.

Strategic Business Services declined to elaborate on any of users' complaints about the 4331 and said it could not supply the size of the survey sample.

Strategic Business Services' report on the tests and survey, "The IBM 4300 Series: Performance/Software/Users," costs \$950 from the firm at Suite 215, 4320 Stevens Creek Blvd., San Jose, Calif. 95129.

"We switched to NCR," says Fred Brown of Rogers Enterprises.

BROWN:

Rogers Enterprises is an optical laboratory that fills almost 5000 eyeglass prescriptions a day. We have a complex computer program that guides us through the entire operation. From selection of the lenses out of inventory through the highly technical grinding process to billing of our customer. We have five years of development tied up in that program. And still we switched from another vendor to an NCR system.

NCR'S DUBOSE:

We could offer you the speed you had to have at a lower price than anyone else.

BROWN:

Yes. And NCR has a full line with no gaps. As our volume increases, we can expand our system in reasonable increments. Even better, we can move to a larger system without obsoleting our software. Now with NCR, I will not have to go through another conversion under the pressure of our daily workload.

NCR'S DUBOSE:

That's NCR's Migration Path Engineering. Your software always runs on the next larger system.

BROWN:

VRX (Virtual Resource Executive) really makes our NCR V-8550 go. Our lab program is very large and is used heavily in the morning, but only occasionally in the afternoon. Because we have virtual memory, this



Fred L. Brown (left) is comptroller/administrator of Rogers Enterprises, Inc., of Beaumont, Texas. Ben DuBose is an NCR district manager.

program resides in main memory only when it is advantageous. Otherwise, that program would choke our operation.

NCR'S DUBOSE:

VRX allows you to run up to 35 jobs simultaneously. It dynamically allocates memory and other resources. It controls virtual memory swapping. It constantly monitors for memory thrashing and program loops. And adjusts the job mix to eliminate them automatically.

BROWN:

VRX also provides Online Program Development. Our EDP manager tells me

OLPD has doubled our programmer productivity.

NCR'S DUBOSE:

System dependability has been important, too.

BROWN:

That's right. System operation is critical to our business. Before we switched to NCR, we talked to other NCR 8500 users and found they had all had excellent experience with this hardware. And with NCR service. We were particularly pleased that NCR had a service office right here in Beaumont.

In the NCR office nearest you, there is an NCR account manager like Ben DuBose who knows your industry and knows NCR systems, including VRX. To learn more about what an NCR system can do for you, phone him at your local NCR office. Or write to EDP Systems, NCR Corporation, Box 606, Dayton, Ohio 45401.



NCR
Complete Computer Systems

Upsurge in Micrographic Use Predicted for '80s

ST. PAUL, Minn. — The use of micrographics will greatly expand in the 1980s, within both existing applications and new applications in business, government, education and the home, according to D.W. McArthur, vice president of 3M Co.'s Micrographic Products Division.

The designer of many earlier microfilm system components, McArthur believes the industry will continue to build on the substantial base already established, causing, for example, the "office of the future" to become the "office of the present."

As more information is accumulated and stored in the coming years, microfilm will be needed in greater proportions, and the marriage of electronics and micrographics will continue to prosper.

Paperless Offices

As for the "paperless office," McArthur predicted that electronic retrieval will make it easier for many dispersed offices to have access to central micrographic data banks.

With traditional hardware becoming more reliable and more complex, the use of microprocessors for self-diagnosis and for manipulation of electronic signals will contribute significantly to micrographics' greater role, McArthur asserted.

Advanced technologies like CRT viewing screens — as opposed to traditional projection techniques — and fiber optics will enable an increase in the use of color in micrographic systems, he added.

Also affecting office systems will be the emergence of micrographics from a "back room" emphasis on archival storage. "Equipment will be human-engineered for use by any office person and will not require special operator training or experience," McArthur said.

"Micrographics will not dominate any total information-handling system, but neither will it be of lesser importance in any given system,

McArthur noted. "All disciplines and technologies will share equally in the improved efficiency and sophistication of the future."

Present technologies will be surpassed by new technologies such as electrophotography that will be developed to keep pace with electronic and other methods of storage and retrieval.

Decentralization and portability, aided by the spread of

cable and satellite communications, will render micrographics more readily accessible to the home.

"Supplemental education, financial data, cultural and travel information are just a few applications that may benefit householders through improved micrographics. Fewer schools may be the norm as the average population age shifts upward, but the need for educational and other

information will increase rather than diminish," he said.

In the area of publishing, the use of micrographic techniques will expand "enormously. Micropublishing, already established in many technical and non-technical fields, may well reach into many aspects of ordinary life, taking advantage of the speed, economy and space-saving advantages of micrographics."

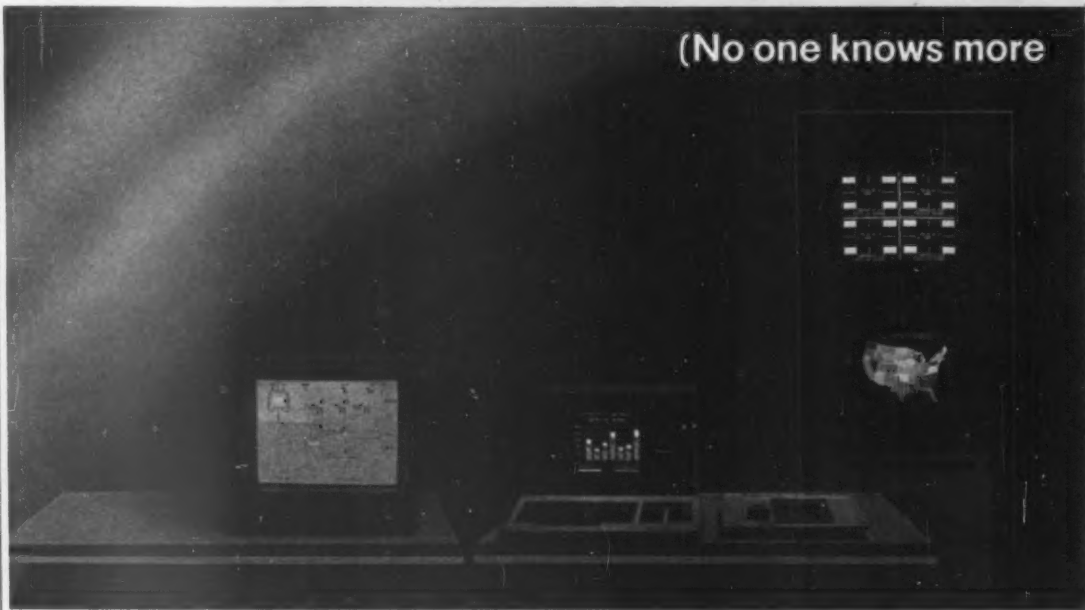
With the continuing increase

in international trade and cultural communications, micrographics will make its mark as a "very effective and efficient" tool, McArthur said.

A number of new companies will design and market hardware and software, especially in Japan, he predicted. In both Europe and Asia, because of growing communications needs, micrographics will probably grow faster than in the U.S., he concluded.

Ask R

(No one knows more)



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A microfilm indexing method introduced by Kodak uses different sizes of marks on the edge of the film.

Kodak Updates Reliant Microfilmer

ROCHESTER, N.Y. — Four microfilming accessories, a multilevel search method and a batch method of microfilming have been announced by Eastman Kodak Co. for its Recordak Reliant 750 microfilmer.

The four accessories, said to offer an intelligent microfilm indexing capability, combine with Kodak's IMT micro-image terminals to allow customers to search up to three

levels of indexed information, the vendor said.

The accessories allow the microfilmer to automatically expose up to three different-size image marks along the edge of the microfilm as documents are being filmed, according to a spokesman. This enables the terminal, when properly programmed with the multilevel search method, to "quickly and accurately" search from the image marks on the micro-

film, he claimed.

The indexing capability offered by the accessories is said to be a progression from traditional straight sequential indexing on microfilm.

Intelligent Controller

The first accessory is an intelligent controller, installed inside the microfilmer, which is actually a microcomputer that receives signals and translates them into microfilmer

operations, the spokesman said.

The controller is factory-programmed with 13 programs, any four of which can be selected for use with the microfilmer. Each index program permits the customer to tailor the operations of the microfilmer to handle a specific application.

For example, the four programs could include one that requires no image marking of the film at all, one that requires only one-size image mark for single-level search, one that requires two sizes of image marks for two-level searches and one that requires all three sizes of image marks for three-level searches.

Document Sensor

The second accessory, a document sensor, automatically senses a bar code patch printed on the lead document of a batch, the spokesman said. When the patch is sensed, the microfilmer can be told to change the size of the image mark of the next image it photographs to the next larger size in order to identify the lead document image to the retrieval terminal.

The microfilmer than automatically drops back to the next smaller mark size.

A third accessory, an image marker, can produce any of three different image mark lengths as instructed by the controller. It can be instructed to produce "no mark" or a small, medium or large mark as documents are fed, the spokesman said.

Finally, a document sensor/imprinter, combining the functions of the document sensor and a sequential imprinter, can be substituted for the document sensor introduced.

The device reportedly will not only sense the bar code patch, causing the controller to change the size of the image mark, but will also print sequential numbers on the documents before they are microfilmed.

The new accessories can be retrofitted to Recordak Reliant 750 microfilers in the field or ordered on new microfilers. For special indexing systems, the Reliant 750 can be operated manually, allowing the operator to apply any size image mark to the microfilm at any time.

Kodak service personnel can reprogram IMT terminals already in use to allow the multilevel search method — or reading of the three levels of image marks — by changing circuit boards inside the terminals. The feature is also available on new units from the factory.

The batch microfilming method, available because of

(Continued on Page 70)

amtek.

about Colorgraphics)



What else can you ask for?

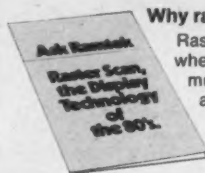
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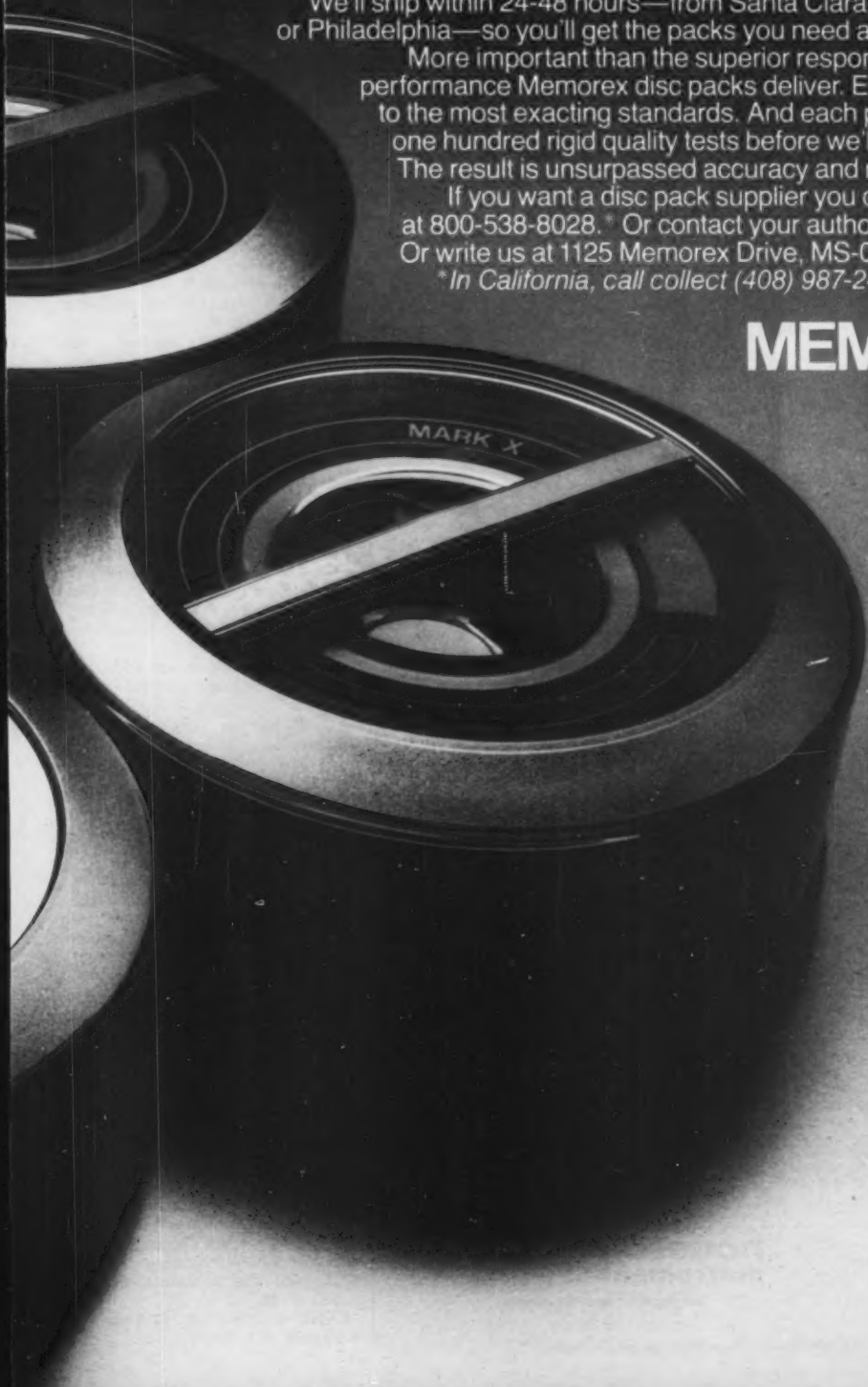
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MEMOREX



Water Utility Makes Upgrade to Improve Service

By Marguerite Zientara
CW Staff

LOUISVILLE, Ky. — Switching from an IBM 360/40 running at full capacity to a Univac 90/60 processor has reportedly enabled the Louisville Water Co. to increase its operating efficiency through a number of on-line programs.

With customer service the highest priority for the 125-year-old quasi-public company, Louisville Water has oriented its computer operations in that direction for its 750,000 customers in Jefferson County.

Since the 90/60 was installed at the beginning of 1979, it has run 24 hours a day, seven days a week. Linked to the 90/60 are 41 Univac UT5 400 intelligent terminals, 36 of which are located



While a customer waits, a service clerk uses a terminal to answer his questions.

in the company's headquarters here and used mainly for customer service

functions.

Four of the terminals are located at the company's Distribution Center here, and one is at the Metropolitan Sewer District (MSD), also here.

"Currently, 16 of the 36 terminals at the main office are completely dedicated to handling customer inquiries, and the remainder are all service-related in one way or another," Charles Schott, manager of systems and programming, noted. "With our terminals, we can display 21 customer records or place an individual record on the screen within 10 seconds."

"By using our master billing cross-index file," he added, "We can access any client's record either by name or address. Each record gives data on two years of customer consumptions and

one year of payments received."

The system is configured with 1M byte of main memory (shortly to be expanded to 1.5M bytes), six Univac 8430 disk drives with a 574M-byte capacity (soon to be expanded to dual-density drives holding 1.1G bytes), three magnetic tape drives, a card reader/punch and a communications subsystem.

Billing for most of 218,000 accounts is done bimonthly, with the exception of 600 large-scale users which are billed monthly. The meter-reading documents are scanned by an optical character reader (OCR) and the information is passed into the computer.

Similarly, the bill stubs returned with payments are read by the OCR equipment and the data input to the 90/60. Corrections or updates to the meter-reading document file and the accounts receivable file are made using terminal applications prior to batch processing.

If a customer walks into a company office, Schott pointed out, a duplicate bill can be readily output by the computer.

Another major application for the 90/60 is generating work orders for all types of customer services from terminal input. A special format is produced on the screen for the operator to complete with the service required — for example, a request to turn off the water.

In addition, an emergency on-line work order system was designed to handle any type of emergency that might require immediate company action, Schott explained.

Since the 90/60 was installed, the water company has rewritten its telecommunications. "We had CICS on the IBM system, which was converted to a version of Vicam for the 90/60 and then changed again into an [Information Management System 90(IMS 90)] format using Cobol," Schott explained.

"We've now come up with additional application programs for telecommunications," he added. The Univac IMS 90 on the 90/60 is "very well-suited to on-line programming tasks."

Kodak Enhances Reliant 750

(Continued from Page 67)

the four image-marking accessories, films documents in relatively small batches of approximately 100.

Applying three different-size image marks on the microfilm permits the retrieval terminal to recognize the difference between batches and individual items in the microfilm file, reportedly resulting in quicker retrieval.

The method is said to make more efficient such applications as check processing, insurance claims processing, retail credit accounting and accounts payable disbursements.

Available in April, a Reliant 750 microfilmer unit with the intelligent controller, image marker and document sensor/imprinter will cost \$20,873. Separately, the intelligent controller will cost \$2,370; the document sensor will cost \$2,235; the image marker, \$710; and the document sensor/imprinter, \$8,095.

Kodak is located at 343 State St., Rochester, N.Y. 14650.

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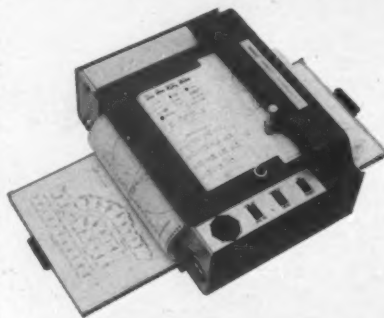
COMPLØT electrostatic plotters and plotter/printers are available with models for printing (2,400 lines per minute on 8½" fan fold paper or 1000 lines per minute on 11" paper); plotting (2" per sec. on 8½" paper or 1.5" per sec. on 11" paper); or simultaneous plotting and printing.

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The new Model 6000 TISPP Thermal/Intelligent/Strip/Plotter/Printer lets you get quality graphics output from either an analog or digital source and provides the continuity and clarity of a continuous trace with alphanumeric annotations under intelligent control. It's the ideal graphical output device for the new generation of microprocessor controlled instrumentation. Available in one or two pen versions. Prices start at \$1,640.**

So... when you think of graphics, think of HI.

For complete information on any of Houston Instrument's digital plotters, printers, and plotter/printers, contact Houston Instrument, One Houston Square, Austin, Texas 78753, (512) 837-2820. For rush literature requests call toll free (outside Texas) 1-800-531-5205.



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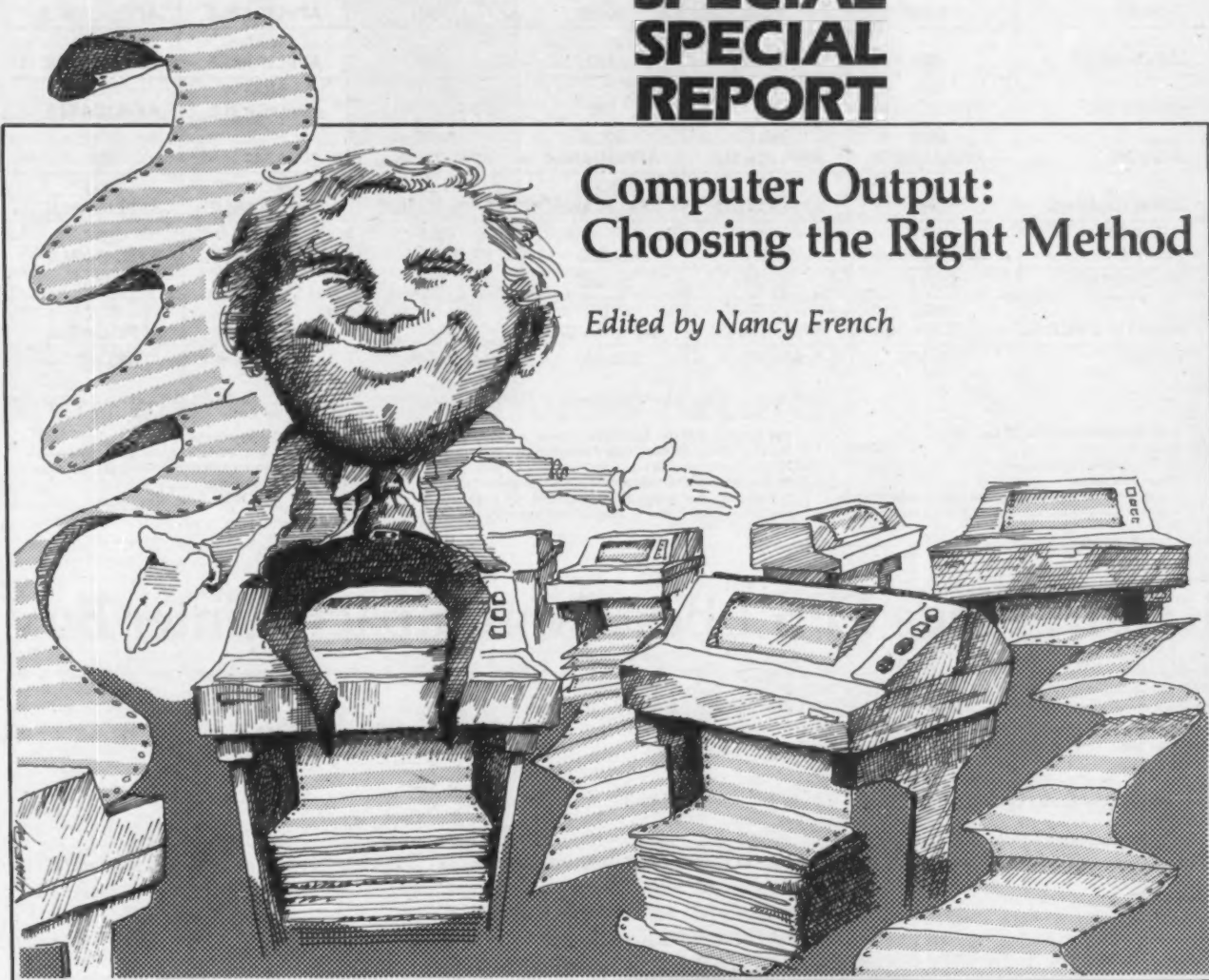
"the graphics - recorder company"

February 25, 1980

**SPECIAL
SPECIAL
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SPECIAL
REPORT**

**Computer Output:
Choosing the Right Method**

Edited by Nancy French



COMPUTERWORLD 

MONTHLY OUTPUT COSTS FOR THREE MILLION PAGES PER MONTH

	IBM 3800	XEROX 1200	XEROX 9700 ³	HONEYWELL PAGE PRINTING SYSTEM I	IBM 1403N-1 SINGLE-PLY PAPER	IBM 1403N-1 THREE-PLY PAPER
NUMBER OF MACHINES NEEDED	2	4	2	2	8	3
PAPER	\$12,900	\$12,300 ²	\$12,300 ⁴	\$20,400	\$15,933	\$24,747
TONER	1,380	1,530	1,500	450	NOT APPLICABLE	NOT APPLICABLE
DEVELOPER	480	1,780	720	180	NOT APPLICABLE	NOT APPLICABLE
FUSER OIL	NOT APPLICABLE	120	120	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE
RIBBON	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	1,320	480
USER CHARGE	5,940	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE
CHARGE PER PAGE	NOT APPLICABLE	10,500	10,500	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE
EQUIPMENT	13,770 ¹	9,000	10,100	5,391 ⁵	\$13,960 ⁷	\$5,235 ⁸
MAINTENANCE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	3,484	NOT APPLICABLE	NOT APPLICABLE
TOTAL	\$34,470	\$34,230	\$35,240	\$28,895	\$31,333	\$30,462

1. Does not include BTS or off-line feature.

2. Three-hole paper.

3. On-line model.

4. Three-hole paper.

5. Prices (on a three-year lease) include a Page Printing System I with one 8-track manual loading tape handler,

one stacker module, appropriate speed adapters and the IBM Ebcidic to Ascii code conversions.

6. Prices (three-year lease) include on-line feature, one stacker module and appropriate speed adapters.

7. Prices (two-year lease) include printer, print chain, controller, 1,100 line/min adapter and universal char-

acter set for printer and controller.

8. Costs (two-year lease) include printer, print chain, controller, 1,100 line/min adapter and universal character set for printer and controller.

Report Finds PPS I Best Nonimpact Printer Buy

WALTHAM, Mass. — For users who print three million pages per month, the least expensive nonimpact printer presently on the market is the Honeywell, Inc. Page Printing System (PPS), Model I, followed by the PPS II, according to a soon-to-be-published study by International Data Corp. (IDC) here.

The figures are based on a survey of 20 Xerox Corp. 9700 sites, representing 31 machines; 19 Xerox 1200 sites, representing 27 machines; and 15 IBM 3800 sites, representing 35 machines.

Although several sites had nonimpact printers from more than one vendor, each site was identified, for purposes of the report, by its most recently acquired printer.

Labor Costs

The IDC study did not include labor costs. However, assuming that one operator is needed for each printer, the labor cost would escalate most rapidly for the IBM 1403N-1, using single-PLY paper, because many machines are needed to produce high-volume output, the report said.

All nonimpact printers included here use plain paper except the Honeywell PPS, which uses dielectric paper. All use toner and developer. The Xerox systems also use fuser oil, while the IBM 1403N-1 use ribbons, the report pointed out.

The IBM 3800, the Xerox 9700 and the Xerox 1200 all cost about the same to operate at three million pages per month, excluding labor costs.

With labor costs considered, however, the 1200 becomes more expensive than the other two because four 1200s are needed to equal the output

of two 9700s or two 3800s, the report said.

Information on obtaining the complete report is available from Judy

Hurwitz, Researcher, Computer Output Program, International Data Corp., 214 Third Ave., Waltham, Mass. 02254.

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IBM 3800 Found Top Nonimpact Paper Eater

By Marguerite Zientara
CW Staff

WALTHAM, Mass. — Of the nonimpact printers that are fast replacing impact printers at large computer sites, the IBM 3800 is the leading consumer of paper. The average monthly use for the 3800 is pegged at 2.4 million sheet/user, according to a study by International Data Corp. here.

While the 3800 is in the forefront of a trend away from impact printers at large sites, Honeywell, Inc.'s Page Printing System (PPS) and Xerox Corp.'s 9700 claim a market share as well, consuming 1.4 million and 1.7 million sheet user each month, respectively.

With such voluminous quantities of paper being produced each month, users must consider paper costs, which in most cases are rising steadily each year.

The dielectric paper used by the PPS is significantly more expensive at .68 cent/sheet than is either continuous-form paper (used on the 3800) at .41 cent/sheet or cut-sheet paper (used on Xerox's 9700 and 1200) at .43 cent/-

sheet, the study reported. Cut-sheet and continuous-form paper claim larger volume segments of the market than dielectric.

Market Shares

In terms of volume, market shares of the different paper types are expected to remain relatively constant from 1979 to 1983, the study found. The continuous-form type, with the largest share of 65% in 1979, will drop only to 64% by 1983.

The cut-sheet market, with a 23% share in 1979, will decline temporarily in 1980 to 20% but rise again in 1983 to a 27% share of the market, as more 9700's are installed and print larger volumes of paper, the study predicted.

Because of its high price, dielectric paper held a disproportionately high share of the dollar value market in 1979 — 18% — although its volume share was only 12%.

One argument against the PPS, in fact, is its use of the more expensive dielectric paper, which offsets the lower hardware price of the printer. Rising paper prices, however, affect

both cut-sheet and continuous-form paper but not dielectric, so the gap between paper types is narrowing, the study noted.

Effect of 'Duplexing'

The expected temporary decline in the 1980 cut-sheet market will result from the Xerox 9700's "duplexing" capability, available for the first time on a high-speed nonimpact printer, the study noted.

The duplexing option, which has been received well by the user community, offers money savings in paper because the same amount of material previously printed on two sheets can now be printed on one. The option also offers space savings because half the volume of paper is needed, according to the study.

In addition, the researchers said, the duplexing feature offers "psychological relief" in view of previous paper strikes that have threatened shortages.

Because of the 9700's flexibilities, many users are condensing print further by printing "two-up," that is, two sheets of information on one page of

paper in the landscape mode (like a book). If the sheet of two-up is then duplexed, paper volume is reduced by four.

It is assumed in the forecast, the researchers noted, that by 1983 the total cut-sheet output would have been 33% higher had duplexing not been introduced.

By 1983, the PPS, too, may have the duplexing feature, which will have the net effect of reducing the dielectric paper output by about 15%, the researchers predicted.

Although in 1978 the volume market share of output from nonimpact printers was only 6% of the output of the entire computer industry (including small business computers, minicomputers, terminals and general-purpose computers), the share will grow to a very large 24% by 1983, according to the study.

Budgeting for Paper

In analyzing dollars spent on paper for nonimpact printers, one should realize that less than 5% of a DP-user's budget is devoted to paper, the researchers pointed out.

However, as most paper gets increasingly more expensive each year and the price of hardware continues to drop, the percentage of the budget devoted to paper will increase, they said.

One of the advantages of nonimpact printers is their ability to create custom forms from plain stock paper, thus saving the user money. The IBM 3800 and the Xerox 1200 create forms by "flashing" a forms negative onto the paper, while the PPS creates forms by using a magnesium cylinder.

The Xerox 9700 creates forms exclusively through the use of software, and the IBM 3800 also has the ability to create forms through software. Because of these capabilities, the use of custom forms will drop from 61% in 1979 to 53% in 1983 as more users create their own from plain stock, the researchers predicted.

Paper Storage Space Cut by Half

Printer Speeds Manufacturer's Reports

ROCKFORD, Ill. — One of the nation's leading manufacturers of decorative hardware for the home is using a computer page printer to speed the production and distribution of daily reports and to reduce to one-half the floor space formerly needed for paper supplies.

"For several years we had a problem with two very large, very important reports for inventory planning and dispatching," according to George Sundberg, manager of DP operations at Amerock Corp. here. "The reports, which totaled about 1,500 pages, didn't get generated until about 6 a.m. It was physically impossible to get them ready in time for people coming into the manufacturing operations an hour later."

"Because the reports were received late, they were using the previous day's information, with the result that the data they were looking at was about 24 hours out of sync. This caused available components and capacity to be allocated to jobs which were not really of the highest priority," the operations manager said.

In April 1977, Sundberg replaced two 950 line/min impact printers with the Honeywell, Inc. Page Printing System Model I (PPS I).

Operating at 12,000 line/min, the system reduced print time by 25%, enabling the two reports to be ready on time. Unlike the impact printers it replaced, the PPS I prints an original document on standard size paper, reducing the need for forms busters and eventually eliminating decollators.

Helps Upgrade Jobs

Not only has the system improved the turnaround time on all reports, it has also helped upgrade the job function of many people previously responsible for collating and distribution tasks, Sundberg said. For example, all reports had previously come from the computer system and were printed out by computer operators. Employees

then decollated these reports and determined the distribution list and number of copies to be sent to each individual.

Distribution, number and decollation are now all handled by the PPS I. This has not only trimmed three to four hours a night from the distribution process, but it has also given those employees responsible for distribution the opportunity to operate the PPS I.

Sundberg also pointed out that the

'Not only has the system improved the turnaround time on all reports, it has also helped upgrade the job function of many people previously responsible for collating and distribution tasks.'

use of the PPS I eliminated the need for \$10,000 in labor costs which would have been required if Amerock had continued to use impact printers.

Honeywell's nonimpact printer operates electrostatically, using roll-feed dielectric paper from Crown Zellerbach Corp. Data and forms images are electrostatically conveyed to the paper as it passes through the system.

Format information, such as logos or headings, are flashed onto the paper as it passes over a changeable magnesium cylinder. The data from the tape unit is conveyed to the paper as it passes over a matrix print head.

A liquid ink or toner is then drawn and bonded to the electrostatic images so the images can be read.

The PPS I is compatible with most mainframes. At Amerock, however, the principal systems are Honeywell 6640s with 256K words per machine.

Advantages of System

A primary feature of the system, Sundberg emphasized, is its ability to

print general ledger, sales reports, manufacturing priority lists, inventory reports and a myriad of internal reports without the need for messy printout carbons that are often illegible.

"People no longer complain that their light-colored dress shirts have been fogged up by carbon printouts," he noted.

In addition, the roll-feed paper has halved the storage areas previously needed for paper supplies.

The system uses roll-cut paper to provide sheets 8.5 or 11 in. wide and from 3 to 14 in. long. Unlike the odd-

(Continued on SR/12)

Low-Cost IBM 3800 Rival Tested by Two Nova Users

By Tom Henkel

CW Staff

HAUPPAUGE, N.Y. — Making headway in a xerographic photoelectronic printer business dominated by big names like IBM, Xerox Corp. and Honeywell, Inc. isn't an easy task, but Uppster Corp. here is trying to do just that.

Uppster's contribution is the Model 6510. A sort of poor man's IBM 3800, the printer cost about one-fourth the price of its IBM counterpart.

But there are some trade-offs. The 6510 isn't quite as fast as a 3800, nor does it offer other features like a graphics capability or forms overlay.

It does have some advantages. It prints on 8.5- by 11-in. fanfold paper, as opposed to 13- by 11-in. paper on the 3800.

In addition, Uppster claims the construction of the 6510 makes it cheaper to run than similar printers because it doesn't require as much heat to produce reports. Since a pressure roller pulls paper through the printer, the manufacturer also claims there is little

that can go wrong with the 6510.

The electronic portion of the 6510 is built by Uppster, but the mechanical portion is built in Japan by Hitachi, Ltd. A spokesman for the company said, however, that Uppster is seriously thinking about ending its relationship with Hitachi.

The Model 6510 is currently available only in an off-line version, but Uppster plans to put an on-line version on the market in the near future.

For Nova Users

The off-line unit "is a magnetic tape printer, so it will run with just about any computer," Uppster Vice-President Edward Brown said. The driving force behind the off-line model is a Data General Corp. Nova 3 minicomputer, he added.

"Basically [the 6510 is] an IBM 3800, although we're in a little different range speedwise — our print speed is 735 in./min.

"We're a little slower, but we feel we compete in most applications with the

(Continued on SR/6)

With State-of-the-Art Printing Broker Soups Up Client Securities Statements

NEW YORK — "Twenty-five hundred 'cooks' made a better broth," according to Jim Settel, first vice-president of marketing at Bache Halsey Stuart Shields, Inc. "And we began to see results immediately."

The "cooks," in this case, are the firm's 2,500 account executives throughout the world, and the "broth" is Bache's new client securities account statement, revamped following extensive studies which included asking the account executives what they want this key document to do.

"The result is an investment tool that completely changes the traditional concept of the client statement's role," according to Hal Rich, first vice-president of computer systems and corporate communications.

"What had been a straightforward document summarizing the month's activity is now a marketing instrument that helps stimulate the client's desire to improve portfolio quality and value. We expect it will strengthen our account executives' position with clients, help bring in new clients and increase revenues," Rich added.

Early Reactions

The expectations appear to be proving out. "Early in January 1979, while we were telling our field people about the new statement due that month, and long before the formal public announcement Feb. 15, a branch manager showed an early copy to a prospect," Settel said. "That person brought in a multimillion-dollar account on the spot. The reaction, both from clients and our own people, has been outstanding."

"We have taken a great step forward in establishing industry leadership, with a 'benchmark' clients can use to measure Bache services against others," Rich said. "In this highly competitive field, Bache stresses the advantages of a full-line investment house. Those advantages include ser-

vice, and a key service factor is the client securities statement."

Rich further noted that the new client statement represents a state-of-the-art development, utilizing the IBM 3800 printing subsystem with its laser technology, which condenses type and prints up to 20,000 line/min.

"We could not otherwise have provided a letter-sized statement with the quality and quantity of information included, in the quantities and within

'What had been a straightforward document summarizing the month's activity is now a marketing instrument that helps stimulate the client's desire to improve portfolio quality and value. We expect it will strengthen our account executives' position with clients, help bring in new clients and increase revenues.'

the time frames required," Rich said. "Previously, the computer had been pretty much restricted to back-office activities, getting the securities industry out from under the volumes of paperwork that threatened to drown us. Now, we're beginning to use it as a marketing tool."

Hundredth Birthday

The new statement appeared as Bache began celebrating its 100th year in business.

Today, the brokerage firm is the principal operating subsidiary of the publicly owned Bache Group, Inc. More than 180 branch, commodity, institutional and sales offices around the world serve multiple markets and a client list that includes about 300,000 active accounts.

"We began thinking about a new client statement late in 1976, as both our clients and account executives began asking for more data on this document," Settel said.

"Clients wanted to know how their securities were performing, and how much they were earning in dividends,

for example. It became clear that it was no longer enough just to tell them what had happened during the month and what they had on hand at month-end."

Settel headed an Enhanced Statement Program task force that set January 1979 as the target date for producing the new statement. Actual design began in May 1978.

"As it turned out, we were able to give the account executives about 95%

of what they wanted," Settel noted. "We came up with a number of 'firsts' — information never before included in a client statement."

In this category are the following:

- **Valuation of accounts.** Almost every security in the client's portfolio — common stock, corporate and municipal bonds, government and agency bonds — is priced and valued according to its position at month-end. Income and yield are also shown for each holding. In practical terms, this means that each client receives a full portfolio review each time he gets his statement.

- **Available for borrowing.** Traditionally, Wall Street used the term "buying power" — the amount of stock that could be bought if one already had an existing margin account.

The Bache statement provides its clients with the amount they could borrow if they decided to open a margin account and borrow against all their securities.

In addition, the term "available for borrowing" implies borrowing for any purpose, not just for the purchase of securities, and can be important to clients as an additional source for ready cash.

- **Listed options available.** Common stocks which have listed options are highlighted, as are all securities upon which money may be borrowed.

- **Dividend tax classification.** This tells the client immediately, rather than at year-end, information as to each dividend's taxability and helps in tax planning.

- **Security status.** This indicates whether a security is being transferred to a client's name, is in safekeeping, or is nonnegotiable.

- **Readability.** "While this may not be a 'first' in the same sense, we devoted special attention to formatting so that the new form would actually invite use," Settel said. "The order of information is such that the client can read the statement somewhat like a newspaper story — grasping the message in the 'headline,' learning the essentials in the first or lead paragraph and then reading through the rest of the 'story,' if desired."

The top section includes the client's name, address of the office serving the client, the account executive's name and a marketing message that can vary from one town or city to another, pro-

(Continued on SR/12)

Laser Printer Outputs Statements At 175 Documents Per Minute

NEW YORK — Bache Halsey Stuart Shields, Inc.'s computer facilities include an IBM 3032 coupled, under Job Entry System/2 (JES2), with a 370/158, operating under Multiple Virtual Storage (MVS). Each processor has 4M bytes of real storage. The 3800 Printing Subsystem operates under JES2.

The information to be printed on the client securities statements is gathered through 3032 operations and stored on magnetic tape in print-ready format. The tape has a cross-reference to the JES2 Job Control Language that the system utilizes when ready for printing.

Operators set up a job through a 3277 CRT terminal used as a console, where printing instructions — such as the paper to be used — are entered.

Printing on the 3800 is similar to off-set printing. A laser beam casts an image onto a photoconductor, and the imaged area attracts toner. The photoconductor is on a revolving drum, and as this turns at high speed the image is transferred to paper. The drum continues to revolve, passing through a cleaning process that makes it ready for the next image transfer.

The paper with the image then passes through a fuser station where heat — at 360°F — is applied under pressure of 40 lb/sq in. This process fuses the toner onto the paper and produces the

finished copy.

At Bache, single-sheet preprinted forms are used only for client copies. Two additional sets of copies are printed separately on plain white paper, obviating the need for interleaved carbon forms that would require decollating, bursting and trimming prior to mailing.

The client forms come off the 3800 ready to be sent to the mail room for immediate automatic folding and envelope insertion.

The set of copies for account executives, and a third set in account number sequence — all originals — make use of a 3800 forms overlay capability. This overlay — or "flash" — is a preprinted image (on a negative) of the lines, boxes and headings normally on a preprinted form.

The overlay is inserted into the 3800 on a frame. The 3800, under program control, picks up the "forms" image and prints it simultaneously with the statement contents. Starting as a blank sheet of paper, each individual statement is printed complete with boxes, heads and variable material — such as data for the account executive — which are not needed on the client copy.

The Bache client securities statement is printed at a steady rate of 175 documents per minute, regardless of the number of lines or words in each statement.

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'Demand Publishing' Speeds Forms Processing

NEW YORK — Users of high-speed electronic printing systems are moving into the long-awaited "demand publishing" mode of operation. Forms and frequently updated documents are being stored on disks rather than in storerooms.

One high-volume user of electronic printing, Bowne Information System, Inc. in New York City, produces documents ranging from reference manuals to customer responses for some 500 professional and government organizations.

During the past year Bowne has been using two Xerox Corp. 9700 electronic printing systems to handle the printed output from its Word/One word processing system. Copies of the latest version of a document, easily updated on disks, can be printed quickly on demand.

"We're now able to provide one-step document production, from text typed on an office keyboard through computer editing to final printing on the 9700 system, with significant gains in productivity both for our customers and ourselves," Bowne President Bill Mahony said.

Bowne's customer surveys indicate users are keenly interested in print quality, the ability to use multiple fonts within a document and obtaining multiple originals, thereby eliminating the need for reproduction.

"Electronic printing has provided significant advantages to our customers in these and other areas," Mahony said.

More Than Printer

Users regard the Xerox 9700 as much more than a computer printer. Many see it as the first of a new kind of intelligent output device that integrates data processing, reprographics, computer output microfilm (COM) and word processing.

The 9700, which prints on standard 8.5-in. by 11-in. plain paper, simultaneously produces computer-generated text and electronically creates business forms (and all other images) on a page. It prints two page/sec, up to 18,000 line/min, depending on type size and format.

The 9700 system creates images electronically, therefore the choice of form design and type style is virtually unlimited. Forms can be switched on a page-to-page basis and individual forms can be revised quickly. Type sizes range from 4-point to headline-size 24-point. Print resolution is 90,000 dot/sq in.

Enhancements Added

The 9700 was introduced in June 1977. As the number of installations increased, users of the system and the Xerox Printing Systems Division realized that the basic machine could be extended to handle other functions. In 1979, three enhancements were announced and are now available.

One enhancement is duplex operation, offering a choice between single-sided or double-sided printing. For example, the covers of a manual could be printed on one side only and the text on both sides to save paper and reduce the manual's size and weight. A page image could be shifted automatically for convenience in binding. The advantages of duplex operation are reduced costs for paper, postage and

storage.

Another enhancement is an optional COM unit. Because this subsystem uses the same input source and logic components as the 9700, the COM recorder and processor can produce images on film with the same flexibility the 9700 offers for printing on paper. Special processing of normal print data is not required; the complete system can switch between film and paper according to the kind of job being run.

Because the 9700 creates forms electronically — storing them on disks for simultaneous printing with data when a form is needed — the COM subsystem does not require the use of a forms slide, as most conventional units do. Instead, forms can be changed from one frame to the next without operator

intervention or delays in system operation. There are, of course, no registration problems.

The third addition to the 9700 is a communications interface to allow input from Xerox word processing equipment. A typical user of the interface would be a company that has already acquired a 9700 and also has a word processing group producing catalogs, manuals or other long documents.

Text can be transmitted by a communicating Xerox 850 display-typing system to the 9700, where it is stored on the 9700 internal disk drive and printed between computer jobs. The difference in using this approach, compared with typical word processing, is significant.

(Continued on SR/6)



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(Continued from SR/5)

sing speeds, is striking. For example, 20 copies of a 50-page manual — complete with covers — could be printed in less than 10 minutes. In addition, the operator of the word processor can use the electronic forms and fonts of the 9700.

Electronic Forms

When the Xerox electronic printing system was announced, an article appeared in the *Business Forms Reporter* with the title "Meet the 9700 — You Won't Like It."

Although the 9700 is hardly likely to eliminate the forms industry, it can replace a great many preprinted forms. This forms-creation facility is especially useful in applications where forms are revised at unpredictable intervals. Even a minor change in a conventional form may result in a series of delays and increased costs, including the scrapping of obsolete forms.

With the 9700, revisions are relatively simple. In addition, the machine can handle paper-stock weights from 16 lb to 110 lb — in any color — to give a variety of choices in the appearance of the finished product.

Laser vs. Impact

The 9700 should not be considered merely a replacement, with high speed, for conventional line printers. Impact printers have some characteristics that cannot be duplicated by nonimpact printers, such as handling oversize paper or producing, as a byproduct of addressing, carbon impressions on a form inside an envelope.

Instead, the 9700 is a wholly different kind of printer that can handle jobs that are inconvenient or just not possible with conventional line printers.

In insurance applications, for instance, policies and rate tables require type of varying sizes. The 9700 can generate from 4- to 30 char./in. with spacing from 3- to 18 line/in. This is equivalent to conventional type sizes of 4-point to 24-point. This range of sizes, plus the variety of fonts and graphics, also means that many jobs that formerly required outside printing for part of the contents of a mailing can now be done completely inside the

company. At least one major insurance firm is now using the system for "demand publishing" of its policy manuals.

Tax Returns

One job that is inconvenient using a line printer is the preparation of tax returns. The Internal Revenue Service

preprinted forms, the computer must first print information on one kind of form for each client who needs it. There is then another print run for the capital gains form, for each attachment and so on. When state forms are added, there can actually be hundreds of print runs to handle the returns of thousands of individuals and busi-

nesses. steps of preprinting, stocking, inserting, collating and controlling forms have been eliminated. For these reasons, service firms that specialize in tax preparation have acquired 9700s.

Evolution and the Future

The use of xerography to produce output from computers is a fairly new



The Xerox 9700 Electronic Printing System

has hundreds of tax forms, and every year many of them are revised. This situation, combined with the general complications of the tax laws, has led to computerized preparation of tax forms, a service now offered by specialized service companies as well as banks and other financial institutions.

Tax form preparation is the kind of application that demonstrates the value of printers such as the 9700, where electronic logic is applied at the printing stage of the process. The actual computation for filling out tax forms is simple, but the printing problems are extremely complex. To use

nesses.

At the completion of all the print runs, there still remains a huge collating job, much of it done by hand. A careful inspection step follows to make sure that each client's set of forms is complete, and that each form in the set has the right information for that client.

In contrast, with a 9700 the forms are stored digitally, and a customer's complete set of pages making up a single tax return is printed in the proper sequence. The printer does not have to be stopped until the whole customer list has been processed. The various

development.

A forerunner of this kind of machine was the Xerox Computer Forms Printer, introduced in 1967 and still widely used. This printer, however, does not accept input either from magnetic tape or directly from a computer. The input is standard fanfold 14-7/8-in. by 11-in. paper from a line printer. The Computer Forms Printer — based on a xerographic processor from a 2400 copier — reduces a page of printing to 8.5 by 11-in. projects special forms designs and makes as many copies as the user wants.

The next development to emerge as a commercial product was the Xerox 1200 printing system. This system produces images directly from a digital source. Forms overlays are used to produce business forms. The 1200, introduced in 1973, was the first xerographic page printer for computers.

Although the 9700 is an evolutionary step from the 1200, the 9700 creates all images by laser scanning, which eliminates forms overlays. The 9700 has also opened the way for demand printing. In effect, laser scanning provides complete control of the images that are transferred to the paper.

In considering future development of this kind of printing, it should be noted that any material in digital form can be manipulated before its conversion to an optical form. The input does not have to come directly from a computer or from magnetic tape. Input can come from a remote telecommunications network; the original source may be a word processing unit or one of various kinds of electronic files.

Whatever the source, input can be reproduced selectively, on demand, to create any images on the page.

Users Test Low-Cost Rival to IBM 3800

(Continued from SR/3)

IBM 3800, Xerox 1200 or 9700 and the Honeywell Page Printing System," Brown said.

User Reactions

Exactly when the Uppster printer will hit the market is a bit of a mystery — even to Uppster. The spokesman said the firm got the idea for the printer back in September. To date, two have been installed at the test sites.

The users of those printers, although they have had the machines for only about two months, said they are generally pleased with them. Both users are service bureaus with a strong need for high-speed printing.

"It's not bad," Steve Sheinvar, operations manager for TBS Computers, Inc., a division of National CSS, Inc., said of the printer. He added, however, that the quality of the 6510 isn't as good as the quality of the IBM 3800.

Sheinvar looked at IBM's 3800 and

Xerox's 9700 and decided both were too expensive.

The second user did not complain about print quality. A spokesman for Anstat, Inc., an apparel industry service bureau, said his only regret with the 6510 is that it doesn't offer a forms overlay feature.

That feature would allow the service bureau to print a picture — like a company logo — on the forms. Without a forms overlay, Anstat must buy preprinted paper — a slightly costlier proposition.

However, even with the extra paper cost, the 6510 costs about two cents a copy less to run than a similar Xerox machine because of the 8- by 10-in. paper format, the spokesman said.

No Price Yet

How much the 6510 costs is somewhat of a mystery. Bill Huba, executive vice-president of International Computer Consultants Corp., which is

distributing the 6510, said the exact price of the unit hasn't really been determined yet.

Huba estimated that the printer will cost in the neighborhood of \$120,000, compared with about \$400,000 for an IBM 3800. Although both machines now in the field are leased, exact rental rates have not yet been set.

The printer takes fanfold paper 3.5- to 12-in. wide and 3.5- to 15-in. long. It prints horizontally 13.3 char./in. The printed document contains 8 line/in.

The 6510 uses a standard 64-character Ascii set. The stand-alone unit comes with a DG Nova 3 minicomputer, a 1,600 bit/in. tape drive, a CRT terminal and a keyboard, Uppster said from 125 Marcus Blvd. Happaage, N.Y. 11787.

New York residents can contact the firm through International Computer Consultants Corp., 20 E. 53 St., New York, N.Y. 10022.

Doing it on Kodak film costs less.

An impact printer can chew up an awful lot of paper. Trouble is, the paper it chews up is costing you more and more every year.

This year, you can expect to pay about \$29.00* per 1000 pages of 3-part computer paper, 56% more than you paid two years ago.

With the price of paper climbing higher and higher, consider the advantages of owning a Kodak Komstar microimage processor. This dry laser printer doesn't use *any* paper. It prints on microfilm, instead. Rather than spending \$29.00 to print a 1000-page, 3-part report, you'll spend only about \$1.00, the price of 9 microfiche.†

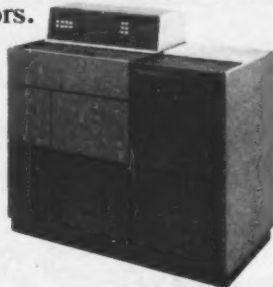
A Kodak laser printer works on-line *or* off-line. It's 6-8 times faster than an impact printer, which means you can save more on time and labor. It takes 50 minutes to decollate, burst, bind, and package a 1000-page report against only 9 minutes to print, duplicate, and package the same report on microfiche.

If savings like these interest you, send us the coupon for more information. Or ask your Kodak representative for a demonstration of Kodak Komstar microimage processors.

Better make up your mind soon, though. Before the next increase in paper prices does it for you.

*Prices vary with geographic location and grade of paper purchased.
†Includes one original set and two duplicate sets.

Kodak Komstar microimage processors.



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☐ Please send me more information about
Kodak Komstar microimage processors.

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STATE _____ ZIP _____ PHONE _____

My total monthly volume of computer printout pages is _____

Delivery Scheduled for April

Nonimpact Printer Outputs 21,000 Line/Min

By S. W. Piccione
Special to CW

In July 1979, Univac announced a general-purpose, versatile and very high-speed printing system called the 0777 Printing System. Scheduled for delivery in April of this year, this system combines state-of-the-art laser and electro-photographic techniques to print at speeds up to 21,000 line/min on standard, sprocketed, single-part paper.

Configured as an off-line printing system, the 0777 consists of a systems controller, a CRT and keyboard operator's console, disk drives, magnetic tape units and the 0777 Printer Subsystem.

The comprehensive software supplied with the system will allow the printing of various standard format tapes. This software also allows the operator to key in or load a file of control statements from tape or disk. These control statements determine the characteristics of the print job — number of copies, line spacings, font selections, headings and so on.

The key element of the system is the Univac 0777 Printer Subsystem. This subsystem consists of a printing mechanism and a microprocessor-based controller with read/write control store.

Lasers and Drums

Figure 1 is a schematic of the printing mechanism. The mechanism contains a laser and deflector system, a continuous-surfaced photoconductor drum,

forms-overlay facility, developer and transfer stations and the fuser and stacker stations.

The rotating photoconductor drum is electrostatically charged with the corona wire assembly. Selected areas of the drum are then discharged by light from the laser, the forms overlay or both.

The rotating multifaceted mirror sweeps the laser beam horizontally across the surface of the drum. An acousto-optic deflector causes the laser beam to either pass through an aperture onto the photoconductor drum or be deflected a few degrees and impinge on the aperture surface, therefore not striking the drum.

The acousto-optic deflector is controlled by signals related to the print data. The laser beam discharges each point of the photoconductor that it strikes, thus forming an electrostatic "image" of the print data.

The resultant electrostatic "image" is toned with charged toner particles by a magnetic brush-type developer station. After the print image is developed, the continuously rotating drum presents the image to the transfer station, which transfers the toned image from the drum to the paper.

The continuously moving paper (29.16 in./sec) in turn moves the transferred image across a heated platen and through hot fuser rolls. This application of heat and pressure melts the toner into the fibers of the paper, forming a permanent image.

After the toner image is transferred

to the paper, the photoconductor drum's surface is cleaned of any remaining toner particles by a rotating fine hair brush and completely discharged by a lamp. The surface can

Each cell can store a 20 by 24 dot pattern. The 0777 contains 128 cells (standard) or 255 cells with the generator expansion feature. The 0777 can therefore print 255 different character shapes per page.

The contents of the character-generator memory can be changed either by loading one or more new fonts from an internal flexible disk or by data sent from the system.

• **Forms-Overlay:** The forms-overlay capability (Figure 4) of the mechanism reduces the need for preprinted forms because this capability allows the user to generate custom forms at the same time variable data is printed.

The forms-overlay mechanism consists of a rotating drum, light and lens assembly system, as shown in Figure 4. The overlay drum is made in various sizes. The circumference of the drum used is equal to the forms-length of the paper being printed. A one-to-one standard negative image of the desired overlay is placed around the surface of the drum.

This overlay-drum surface rotates at the same speed as the surface of the photoconductor drum. If a forms-overlay pattern is desired, a lamp within the forms-overlay drum is turned on. As the drum turns, a line of light from this lamp passes through the overlay image. This light is focused on the surface of the photoconductor drum.

• **Paper Transport:** The paper transport is designed to drive standard, single-ply, sprocketed printout paper. The pin-feed tractor assembly swings out for easy paper loading. This feature, coupled with the short paper path, allows an experienced operator to load a new box of paper, without splicing, in less than one minute. The load time is even less if the optional splicing station is used.

The paper transport is capable of backing up the forms so that the next page can be printed starting at the physical top of form. This feature allows the 0777 to print across perforations — a 1-in. clear band is not required around the perforations.

• **Fuser:** The 0777 uses a combination hot platen and hot fuser-roll system to "fix" the print image. The fuser roll is constantly being cleaned by a si-

(Continued on SR/10)

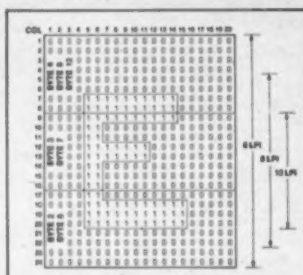


Figure 3. Memory Cell for Letter 'E'

now be recharged by the charge corona, and the cycle outlined above can be repeated.

After the paper leaves the fuser rolls, it is restacked or refolded by a powered forms stacker included with the mechanism. The refolded stack is now ready either for further processing by standard off-line equipment — bursters, trimmers, and so on — or for direct delivery to the users. The mechanism can also be interfaced to an on-line burster-trimmer-stacker.

Printing Mechanism

The following paragraphs will describe the various elements of the printing mechanism in more detail.

• **Dot Matrix Printing:** The 0777 prints characters by a high-density dot matrix method. Figure 2 outlines this method of printing. Six laser beams are simultaneously swept across the photoconductor drum's surface by a rotating multifaceted mirror. A seventh beam is used for timing.

Each beam prints a microline. Six microlines are printed per sweep and four sweeps are needed to print a complete character (at 6 line/in.) Each beam is individually controlled by the print logic.

• **Character-Generator Memory:** The dot patterns for the characters are stored in the character-generator memory. One character is usually stored in one memory cell. A memory cell for the letter "E" is shown in Figure 3.

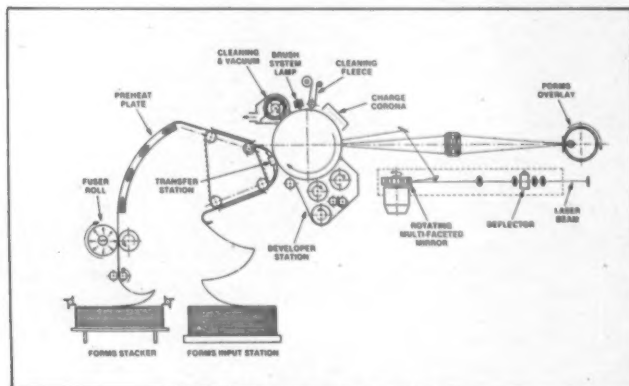


Figure 1. Schematic of Printing Mechanism

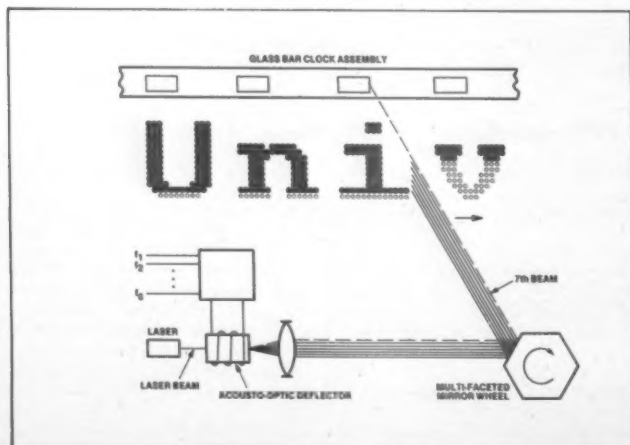


Figure 2. Outline of Dot Matrix Method

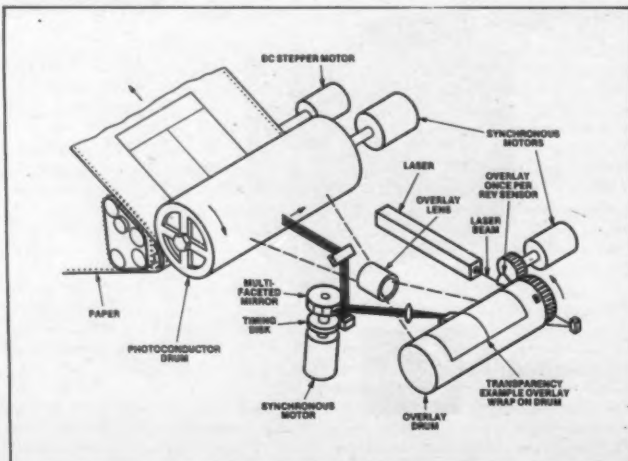


Figure 4. Forms Overlay Mechanism

Buyer's Checklist Suggested for Printer Users

By John G. Henry

Special to CW

What should you consider when you have to buy a printer? That is a question prospective buyers face from time to time.

Unfortunately, these same buyers also face a deluge of conflicting claims from representatives of competing printer manufacturers, each of whom insists his product offers the vitally important features that must be considered in the purchase decision.

What each vendor stresses as important depends on that vendor's perspective, of course, and may have little relationship to the buyer's real needs. Not surprisingly, firms offering a low-priced product tend to focus on initial cost as the primary consideration, while those with higher-priced, more reliable equipment emphasize such factors as mean time between failures. Manufacturers with high-speed gear stress performance. International firms point to their worldwide maintenance and service networks as major plus factors.

Who is right? What criteria should end users apply to their particular situation? The answer is all of the above... and more.

Cost of Ownership

The sensible buyer must consider the purchase price, reliability, performance and speed of the units as well as the vendor's support capabilities. However, specific factors as diverse as the type of printer (serial, dot matrix or line mechanism; impact or nonimpact technology), available options and the manufacturer's reputation also affect the true total cost of ownership.

The following points are offered as a guide for prospective printer purchasers calculating future costs of ownership:

- *Is the printer vendor reputable?* Do I know (or can the vendor refer me to) satisfied customers?

Printers are not inexpensive. When you buy one, you want to be absolutely sure the vendor will be there when and if service is needed. One of the best ways to assure this is to buy the printer from a firm with which you are familiar, a firm that positively stands behind its product and is not likely to run from trouble.

- *Is the vendor financially sound?* Does the firm have the ability to make the heavy investment in research and development so essential in this industry?

You want to be sure the firm you select is an established leader in state-of-the-art technology today and that it has

the continuing potential to be a leader in the future as well.

- *What type of printer is best for my requirements right now?* What type will be best in five or 10 years? Does this vendor offer larger, faster units or units with application features appropriate to my needs?

No one knows for sure how fast your business will grow. It is entirely possible that in a few years the unit you pick

now will be totally inadequate for your needs. You may then seek to upgrade your system

and economical — if you could make that transition without changing suppliers.

'Not surprisingly, firms offering a low-priced product tend to focus on initial costs, while those with higher priced, more reliable equipment emphasize such factors as mean time between failures.'

with a unit capable of handling heavier work loads. It would be very convenient —

- *What about delivery time?* Lead times for delivery of products is of paramount im-

portance in the expansion of business in today's economy. Because it is difficult to estimate how fast your business will grow, you will want to select a manufacturer that can respond to expanding business requirements quickly and with assurance. Missed shipments could mean loss of business for an end user.

- *What about print speed?* Just how important is speed to

(Continued on SR/15)

"Our On-Line Computer Output Microfilm Recorder is extremely fast, inexpensive to use and simple to operate."

DatagraphiX recently spoke with Mr. John E. Dye, Senior Director of Information Services, Blue Cross and Blue Shield of North Carolina, about his company's decision to install an on-line COM system.

DatagraphiX: What prompted you to consider an on-line microfilm recorder?

Dye: There were basically two major reasons. Faster turnaround and operational convenience. With on-line COM we could eliminate all of the tape handling. It doesn't require extra people and there is no throughput delay. We can get microfiche duplicates to the users much more quickly than paper reports.

DatagraphiX: Previously, you used a service bureau. Why did you decide to purchase your own unit?

Dye: We did a cost justification study and found that the money we were spending on a service bureau was just about what we would have to spend for our own COM recorder. Initially, our present needs would utilize only 20% of the machine's capabilities, so we could grow without additional equipment costs. Economically, it made sense.

DatagraphiX: Why did you choose a DatagraphiX on-line COM?



Dye: I've used DatagraphiX equipment for about 15 years. I have found DatagraphiX to be a good, solid company that supports their equipment and provides reliable service.

DatagraphiX: Did you encounter any difficulties in the transition to on-line?

Dye: We were impressed with how easy it was. Our technical librarian was able to perform most of the conversions. And DatagraphiX supplied very thorough training in hardware operation and the use of its on-line software.

DatagraphiX: So you are satisfied with the reliability of the AutoCOM II®?

Dye: Very much so. Uptime is better than 95%.

DatagraphiX: What is your overall reaction to the AutoCOM II?

Dye: It meets our most demanding data processing requirements. It saves time, material, space, and money, just to mention a few advantages. Also, we believe microfiche has great advantages over paper in cost and availability. If we experience another paper shortage, we have the secure feeling that we have a backup. Like Blue Cross and Blue Shield protection, it's reassuring to know we're covered against emergencies.

For further information on how DatagraphiX COM systems can help, call or write for our free brochure. P.O. Box 82449, San Diego, CA 92138, (714) 291-9960, Ext. 581, TWX (910) 335-2058.

DatagraphiX®

a General Dynamics subsidiary

Nonimpact Print System Gives 21,000 Line/Min

(Continued from SR/8)

licon oil-impregnated felt. This process prevents offsetting or the transfer of a partial image from one page to another. The oil system also allows the 0777 to fuse at a fairly low temperature. As a result, most preprinted forms and even peel-off labels can be processed in the 0777 without any problems.

Microprocessor Controller

A general block diagram of the controller is shown in Figure 5. This design utilizes a read/write control store, which gives the flexibility required to

(line x) being sent by the system to the 0777 subsystem. A line of data consists of a string of bytes with each byte representing one print character.

The interface logic places this line of data in an area of main memory called the input line buffer and then signals the microprocessor, via a hardware interrupt, that line x is ready for further processing.

Upon receiving the interrupt, the microprocessor accesses the data in the input line buffer, compresses the data (using an algorithm that eliminates storing strings of identical characters) and then puts the compressed line in

does not stop between lines but between pages. When the machine is printing, the paper moves at a constant speed of 29-1/6 in./sec.

Figure 7 lists the equivalent line rates for this speed for the three different line densities. For example, printing an 11-in. page at 12 line/in. will result in a line rate of 21,000 line/min, a factor of 10 greater than Univac's fastest impact printer.

Besides printing at three different line spacings (6-, 8-, and 12 line/in.), the 0777, unlike most existing impact printers, will also allow the user to print the various line spacings within a page. For example, line n on a page can be printed at 6 line/in., line $n + 1$ at 12 line/in., line $n + 2$ at 8 line/in. and so on. Any combination or sequence of spacings is allowed.

Because of the dot matrix method of printing and the design of the controller's print logic, the 0777 can print at various character spacings either on different lines or within the same line. Figure 7 lists the three common spacings of 10, 12 or 15 characters per horizontal inch.

The 0777 is not limited to the three column spacings listed above. Special fonts can be designed to produce a wide range of column spacings (character pitch). Proportional printing is made possible by using a font whose pitch varies according to the character printed — the letter "I," for instance will be designed to print at a smaller pitch than the letter "W."

Print Characters

The 0777 controller contains a character-generator memory capable of storing 128 different character shapes (standard) or 255 character shapes (feature). The user can therefore print any of 255 characters or shapes on any given line. In addition, the internal diskette holds data for 15 fonts, or 960 character shapes.

Any of these fonts can be loaded in the character-generator memory between pages. A given job, therefore, can be printed with up to 960 different character shapes. If character shape information is loaded by the system, the number of character shapes per job is limited only by the dot resolution of the machine.

Since the 0777 controller stores print data by the page, the user can print copies simply by specifying the number of copies along with the page data. This reduces channel and system-loading since the page data need be transmitted only once. The maximum number of copies that can be specified for a sequence is 255.

In addition to a one-for-one copy, the 0777 design will allow the user to selectively modify or change data on a particular copy or copies. This capability is called copy modification.

One application of copy modification is to print different headings on various copies of the same data — for example, Customer's Copy, File Copy, Accounts Receivable Copy. The advantage here is that the bulk of the data (the constant data) need be transmitted only once. The subsystem will save the constant data and apply the variable or copy modification data (e.g., the headings) to the various copies as they are printed.

Another useful application of copy modification is equivalent to the "spot

carbon" of impact printers in which some information is omitted from selected copies of a page. In the 0777 application, the user sends copy modification data consisting of blanks.

Forms Generation

Special character sets have been designed for the 0777 that, when used together, allow printing of almost any combination of horizontal and vertical lines (see Figure 7).

By using copy modification, for instance, the user can electronically generate a form. In this case, the form data (sequence of the special characters) is first transmitted to the 0777, followed by the copy modification data, which consists of the varying print data of the job. The 0777 will combine the special characters with the print data to produce the final output.

Again, channel and system loading

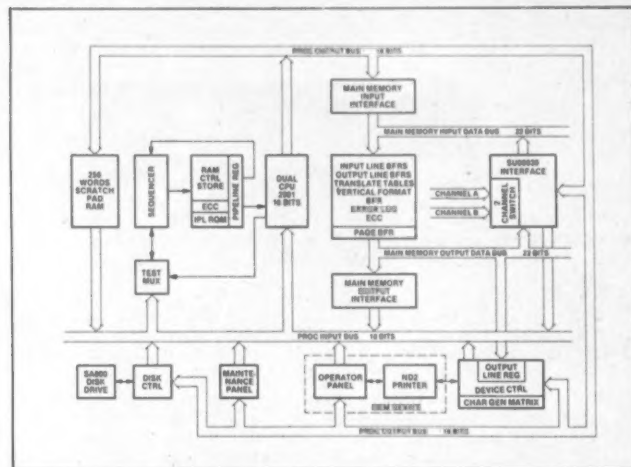


Figure 5. Block Diagram of Controller

make planned-performance enhancements or features easy to implement.

The read/write control store also improves maintainability by allowing a customer engineer to load and execute diagnostic microcode. The microcode can be loaded from the system or from an internal flexible disk subsystem.

The flexible disk can be used to load character sets as well. Each diskette can hold up to 15 character sets and each set can consist of up to 64 characters.

The main function of the subsystem's controller is to maintain the flow of print data first from the system, then to temporary storage in the page buffer and finally to the laser control electronics.

Figure 6 shows the print data flow. The activity starts with a line of data

its proper position in the page buffer, along with other lines for that page.

Once a complete page is stored in the page buffer, the microprocessor starts the printing process. Figure 6 assumes that line y of page $n-2$ is ready for printing. The microprocessor decompresses line y and places it in an area of main memory called the output line buffer. The print electronics uses the data in the output line buffer to modulate the laser beam and, therefore, to print characters.

Figure 7 lists the major functional characteristics of the 0777 subsystem.

Speed and Spacing

The 0777, unlike most impact printers, prints on a page basis — it

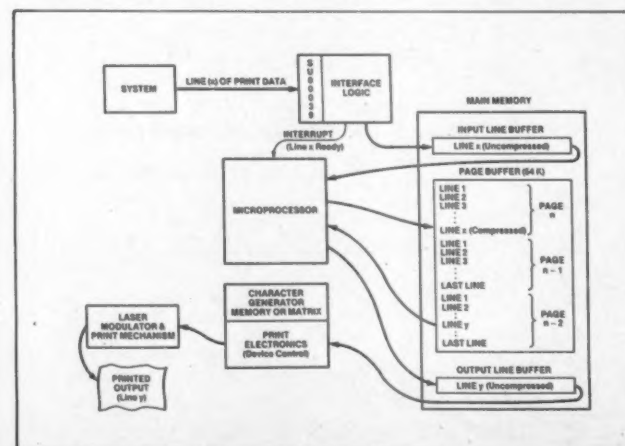


Figure 6. Print Data Flow

- PAPER SPEED — 29-1/6 ips
- PRINTING SPEED
 - Text Independent (11 inch form)
 - 8 lpi 10,500 lpm
 - 8 lpi 14,000 lpm
 - 12 lpi 21,000 lpm
- COLUMN SPACING
 - 10, 12, 15 cpi, Proportional Spacing
- PRINT COLUMNS
 - 10 cpi 136 max
 - 12 cpi 163 max
 - 15 cpi 204 max
- PRINT CHARACTER DESIGNS (on Line basis)
 - 128 Characters (Standard)
 - 255 Characters (Feature)
- PRINT CHARACTER DESIGNS (on Job basis)
 - 960 Characters (15 fonts) per Diskette
 - Unlimited from System
- COPY AND COPY MODIFICATION
 - Copy Headings
 - Spot Carbons
- FORMS GENERATION (by Overlay)
 - FORMS GENERATION (by Special Characters)
 - e.g. A, T, F, L, J, -, I, etc.
- HARDWARE UNDERLINING

Figure 7. Common Character Spacings

are reduced since the form-design information is sent only once every 255 pages. In addition, electronic forms generation allows more than one form design per job with no operator intervention.

Forms can also be generated by use of the overlay-drum feature, which has the advantage of requiring no data transmission from the system except the form-flash command itself. In addition, the overlay feature gives the user the capability of printing very complex or elaborate forms that could not be generated electronically.

Hardware Underline

The 0777 will allow the user to print an underline under any character or characters within a page. This function is performed by hardware that does not require underlined characters within the character-generator memory, therefore the character-generator positions need not be "wasted" by requiring them to contain underlined and not-underlined character designs. The number of character shapes available to the user for a page or job is consequently increased.

In summary, the Univac 0777 Printer subsystem is more than just a faster line printer. It offers users more flexibility and capability to solve their ever-increasing problems with data presentation, preparation and distribution.

Piccione is manager of Peripheral Development II at Univac, Blue Bell, Pa.

What Level Print Quality Required? Selection Criteria for WP Printers Examined

Special to CW

With more and more word processing (WP) software programs being run on computers, the important considerations in selecting a WP printer should be reexamined. One of the most important criteria is determining the level of print quality that will be required.

Until the introduction of the metal daisy print wheel, WP outputs requiring a high level of print quality had to be done on "golf ball" typewriter devices. The print quality of the daisywheel, however, equals or exceeds that of the "golf ball."

Speed has also been dramatically increased from the approximately 17 char./sec of the "golf ball" typewriters to the 35- to 45 char./sec range of the daisywheel printers. Users were then given a choice between the metal daisywheel or plastic wheels, with the level of print quality being the deciding factor.

Plastic vs. Metal

The physical construction of the metal daisy print wheel, introduced by Xerox Corp. in 1975, makes it particularly adaptable to situations where superior print quality is required the majority of the time. The metal wheel is designed to withstand a high hammer impact, which gives the printer the capability to perform such special tasks as cleanly imprinting all pages of 12-part carbon forms and consistently producing clear and sharp images on hard surface stock — e.g. ledger cards.

Plastic wheels also deliver high-quality print output, but they do not produce as clear and sharp a character image as their metal counterparts, nor do they have as long a useful life. The output quality of plastic wheels also degrades continuously as they are used, while metal print wheels produce the same high level of quality output over their useful life.

A plastic print wheel, therefore, degrades until it no longer produces an acceptable output. A metal print wheel will produce excellent quality output until a microscopic crack in the metal causes a piece of a character or an entire character to break off.

Factors to Consider

Other important factors to be considered during the printer selection process include:

- **Print Wheel Variety:** Does the printer supplier offer a wide variety of print wheels? Are they the ones most needed for your applications? For example, there is now an extensive selection of scientific, technical and financial fonts available. The greater the variety and selection of print wheels available to you, the greater the flexibility you will have with your WP system.

- **Proportional Spacing:** Is the printer being considered capable of producing true proportionally spaced output? This capability greatly enhances the aesthetic appearance of the final copy.

- **Right-Hand Margin Justification:** Can the printer justify text between the margins? This "plus" feature not only enhances the overall print quality, but adds to the versatility and flexibility of your WP system in meeting specific job requirements while main-

taining ease of operation.

- **Statistical Work:** If statistical copy preparation is part of your overall work requirement, then the printer must be capable of performing such tasks as automatic decimal and column alignments.

- **Forms and Forms "Fill In":** When forms preparation and/or completion, or "fill in," represent a significant part of the average work load, the printer must have such features as programmable spacing and tabbing. Without them, forms "fill in" work is tedious, difficult, time-consuming and, consequently, subject to errors.

'The metal wheel is designed to withstand a high hammer impact, which gives the printer the capability to perform such special tasks as cleanly imprinting all pages of 12-part carbon forms and consistently producing clear and sharp images on hard surface stock.'

- **Reproduction Copy:** If offset masters are to be prepared, metal print wheels offer the best way to prepare them. If "camera-ready" copy is the requirement, the clear, sharp and precise metal print wheel character images make the resulting reproduction that much better.

- **Speed:** How important is speed to your work load? Is the work evenly distributed, or is it the "peak and valley" kind? The difference between 35- and 45 char./sec is minimal when you consider the overall print time of WP systems. However, if speed is critical, then perhaps a matrix printer with a speed of 100+ char./sec should be considered. It must be remembered, though, that the print quality of a matrix printer cannot be compared to that of a daisywheel printer. There is just no basis for comparison.

- **Graphics:** Is there a need to produce graphs, curves and tables? WP printers have graphics capability, and some can be fitted with options that give the unit advanced plotting functions. In many cases, this type of work has often been "farmed out." Just as often as not, this procedure induces delays in project completion. Certainly, it adds to the cost of preparation. An in-house graphics capability is the best safeguard for information that is classified as company confidential.

- **Oversize Documents:** A wide bed printer is the answer to many oversize document preparation problems. Some wide carriage printers are equipped with bidirectional tractors for the precise control of continuous forms. Printers with line lengths of 26.3 in. that convert to 264 char. at 10 pitch or 316 char. at 12 pitch will accommodate many special legal and accounting forms.

- **Paper Handling:** WP printers can be equipped with a wide variety of paper-handling systems that reduce operator intervention to an absolute minimum. For example, bidirectional forms tractors can precisely control paper feed of continuous forms in forward and reverse directions. Cut-sheet feeders can handle letterhead, eliminating hand loading of the printer. There are numerous paper-handling systems designed specifically to reduce operator intervention or to eliminate it

entirely and should be investigated during the printer selection process.

- **Special Documents:** The unusual job — preparation of overhead transparencies, vellums and so on — can be handled with relative ease on a metal wheel printer. The harder strike force of the hammer assures a clean, even line of character images.

- **Supplies:** The range of supplies available from the printer manufacturer should figure in your investigation. For example, different jobs really require different ribbons: multistrike ribbons for maximum character resolution and clarity; fabric ribbons for



The Diablo Systems, Inc. 1650 series is an example of a printer offered for word processing applications requiring large volumes of high-quality printouts.

wheel and costs only about four times as much. The ease and convenience of loading ribbons and print wheels should be calculated against cost. The number of impressions of both the wheels and ribbons should be a known factor.

In summary, there are a number of items to consider when evaluating a WP system printer. A complete review of your application areas is most important, so you can make a list of intelligent criteria. Armed with this evaluation checklist, talk to several suppliers and see the printers operate under conditions simulating yours.

Life Expectancy

The cost and service life of print wheels should also be determined. For example, a metal print wheel typically lasts five times as long as a plastic

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Broker Soups Up Client Securities Statements

(Continued from SR/4)
viding locally oriented investment information even as it helps personalize the statement.

Account Profile

Next is the account profile which includes opening and closing balances (cash, margin, total and "short" balances); income for the period and year-to-date broken down into dividend, municipal, other interest income, as well as the total; and portfolio information including priced value, net worth, and available for borrowing.

Then the statement details and describes every transaction for the month, in chronological order, highlighting the nature of the transac-

tion (dividend, interest, bought, sold and so forth).

A portfolio summary lists each security held with price, value, income and yield all on the same line to provide total portfolio evaluation at a glance. The final category lists any open orders, with status.

"Beyond its obvious value to the client, portfolio pricing frees the account executive of a time-consuming chore," Settel said. "The AE can quickly spot individual securities whose yields are below the portfolio average, and that should be reviewed and brought to the client's attention as a potential candidate for upgrading. The statement also highlights the registration status of every security in transit, in safekeeping or that's nonnegotiable."

Beyond the contents and formatting of the new statement, the account executives and others had additional requirements — for example, that statements be provided in sequence for ease of distribution. Top quality was also required, to further enhance readability and usability. Finally, the capability was desired to print on the account executive's copy technical information not required for the client's copy.

"These requirements were actually state of the art, and therefore in effect mandated use of the 3800," according to Phil DePaolo, vice president of computer systems production.

"To provide three copies, in separate sequences, of 300,000 client statements every month requires very high speed, and the 3800 prints our state-

ments at a rate of 175 per minute. Top quality stems from the fact that each 3800 copy is an original."

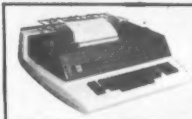
Bache has two 3800s, one delivered in October 1978 and the second in January 1979. Their introduction coincided with upgrading of Bache computer facilities to include one IBM 3032 and one 370/158, each with 4M bytes of real storage, operating under Multiple Virtual Systems (MVS).

"We are installing a nationwide on-line system to include all of our branch offices, which will run under these processors," DePaolo said. "The programming is being done on-line through the Time-Sharing Option (TSO) that was also used for 3800 programming."

"The first new client statement was delivered in January 1979, meeting the schedule set a year earlier — but that schedule could not have been met without the added efficiency and overall assistance provided our programmers through TSO," he added.

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- ☐ Impact
- ☐ Non-Impact
- ☐ Solid Font
- ☐ Matrix Font

SPEED (LPM):

- ☐ 10 to 100
- ☐ 100 to 500
- ☐ 500 to 1,000
- ☐ 1,000 and above

MY SYSTEM IS:

- ☐ Burroughs
- ☐ IBM
- ☐ Honeywell
- ☐ Univac
- ☐ Other _____

MY NEED IS:

- ☐ Immediate
- ☐ 1 to 6 months
- ☐ 6 months to 1 year
- ☐ After 1 year

Page Printer Speeds Reports

(Continued from SR/3)

sized computer printouts of the impact printer, the roll-cut paper is versatile and convenient to store. Paper waste averages below 2%.

Other advantages Sundberg likes are:
• If holes need to be punched in pages for ring-binder storage, this information is easily keyed into the print subsystem's minicomputer. Perforation can also be keyed in as a requirement.

• The Honeywell PPS I is a stand-alone system that freed the two Honeywell computers for other jobs. When the mainframes had been used with impact printers, the process occupied a large percentage of their time.

• Custom forms on the PPS I cost the same as stock paper after a cylinder for the custom form has been made. This cylinder usually costs about \$350 to \$500.

Today, Amerock uses the Honeywell PPS I to produce 850,000 pages monthly and is now considering customer catalog production on the equipment. Overall, Sundberg is pleased with the system and the quality of the paper.

Downtime Only 1%

As for downtime, the system has been remarkable, according to Sundberg.

"Except for a period two and a half years ago, when it was first installed and when Honeywell had no one in field service in this area trained to maintain the machine, downtime has been less than 1%," he said. However, Sundberg did say the machine requires considerable preventive maintenance.

Amerock's DP shop, which handles mainly batch processing, is operational 24 hours a day, five and a half days a week. Its big print jobs are run at night so, although Sundberg has to give up the system for preventive maintenance for 4% of his shop's operating hours, the field service engineer performs that work during the day.

The firm's other printer is a Honeywell PRU 1,200 line/min line printer, he said.

Printer Copes With Cold, Humidity Meat Processor Says Output Labels Well-Done,

Special to CW

DEFIANCE, Ohio — In the old, damp environment of a meat-processing plant, it is important to have a printer that can produce labels under the most extreme conditions without failing. A shutdown would idle assembly workers and delay processing of a large quantity of meat.

"If the computerized processing system stops for two minutes, we will be down in other areas of the plant," according to William R. Hohenberger, manager of industrial engineering for Dinner Bell Foods, Inc. here, which processes large quantities of meat for shipment to supermarkets. "And a label printer is one of the critical elements of the system."

In operation since November 1978, Dinner Bell's printing system paid for itself within three months and continues to save the company money, according to Hohenberger.

"We have increased production 10% daily in all departments, not only by increased speed, but by reduced downtime," Hohenberger said. "And in a plant that produces 300,000 to 400,000 pounds of meat per day, that is significant."

Located at the end of the production line, the printer labels boxes and plastic containers (lugs) according to the type of meat cut, net weight and date. If the printer breaks down, a backup

will occur within two minutes, Hohenberger said.

To cope with the conditions of this critical atmosphere, Dinner Bell selected a Dataroyal, Inc. IPS-7000 intelligent printer. The printer is microprocessor-controlled, operates at 120- to 200 char./sec and can handle variable-size forms.

Temperature Control

The printer, located on the shipping floor, is encased in a stainless cabinet that keeps it at operating temperature. Temperatures outside the cabinet average 32° F because the whole building is refrigerated.

The labels, which measure 3 in. by 5 in., are pressure sensitive. A label peeler attached to the printer makes application to the boxes and lugs easier for operators.

"The ability to adapt to the label-peeler was one reason we chose the Dataroyal printer," Hohenberger said. "Competitors offered label-generators that could apply labels automatically, but this process could not be used on the recyclable plastic lugs." Before Dinner Bell bought the printer, workers had to stamp the identifying information on the boxes in ink or write it by hand, increasing the chance of a labeling error.

Another important feature this processing company wanted in their new

printer was the ability to generate very legible variable-size print.

"The weight must be displayed clearly and largely enough so that no mistakes can be made," Hohenberger explained.

Federal Labeling Requirement

Requirements for labels are strictly defined by the federal government, according to Mike Elbersen, systems engineer for Dinner Bell. This definition includes the number of characters and lines that should be included in the product descriptions.

Dinner Bell prints the date in a single line of 1/9-in. characters, the descrip-

tion in two lines of 2/9-in. characters and the weight in 1/3-in. characters. Some labels, Elbersen pointed out, use as many as 50 characters to describe an item.

Several features of the Dataroyal printer contribute to the high quality of the labels produced, according to Elbersen. The print head not only operates bidirectionally, it can also reverse speed, which facilitates faster and better alignment on each printed line. In addition, the rubber margin-stops can be brought close to the head, so that the head does not have to traverse the entire printer carriage in pro-

(Continued on SR/14)

High-Speed Line Printers Meet Specialized Needs

Special to CW

Not too many years ago, universities, commercial firms and industry utilized a single mainframe for primary DP requirements including payroll, inventory, accounts receivable and so forth. Scientific and technical processing was frequently handled on a time-sharing basis with individual departments responsible for their own solutions to DP problems.

More recently, however, many of these former time-sharing applications have been converted to in-house minicomputers for added control and for informational security.

While most minicomputer manufacturers and suppliers can provide only a very limited number of medium- or high-speed line printers for use with their systems, a number of firms specializing in printers and printer interfaces have emerged to provide minicomputer users with a broader range of printer peripherals to meet their specific needs.

The ability to incorporate higher speed and quality printers and to choose from among a variety of types — including band, drum, train and charaband — provides increased latitude in setting up distributed DP (DDP) systems.

University Users

For instance, Purdue University in Lafayette, Ind., recently installed 11 Digital Associates Corp. line printers to use as remote output devices. These printer systems included CT-6644/1210 Chaintrains.

Distributed throughout the campus,

they are connected to the DP center via dial-up communications lines. According to John Steele, computer center chairman, "We needed a printer that could be used for high-speed output, was highly reliable and was priced to fit our budget."

"The Digital Associates' printers were less expensive than those from other suppliers and [it] supplies spare parts and product support. We have found Digital Associates Corp. to be very helpful in answering technical questions. In addition, we felt comfortable that we were able to fill all our printer needs through one source."

At Michigan State University in East Lansing, meanwhile, Louis Greenberg, the director of computer sciences, has stated that, "Digital Associates' prices were significantly less than the manufacturer's. We needed a printer to withstand 15 hours of use a day and still give quality performance." The Michigan State printer is a CT-6644/4964 Chaintrain. ...

Both Purdue and Michigan State maintain their own equipment and only call on Digital Associates for specific technical support. Other users depend on Digital Associates for all their service needs, such as Dow Chemical Co., which has more than 30 Digital Associates' V-132C and CT-6644 printers in cities throughout the U.S.

Digital Associates assumes responsibility for customer training, product support and spares provisioning. Spare parts are available in the field, and the product support group also serves as a troubleshooting backup.

(Continued on SR/21)

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Low Price, Easy Maintenance

Food Dealer Sold on Cost-Cutting Band Printer

Special to CW

SALISBURY, Md. — A low purchase price, long-term ease and economy of maintenance were the main reasons members of a food distributors group here chose the newer technology of a band printer system instead of a drum printer.

Shoreland Food Service, Inc., a member of Continental Organization of Distributor Enterprises, Inc. (Code), now uses a B-300 band printer system purchased from Southern Systems, Inc. (SSI), based in Fort Lauderdale, Fla. The printer was an upgrade replacement for a Digital Equipment Corp. printer, the LA-180, functioning on DEC's PDP-11 processor.

Subsequently, recommendations by Shoreland resulted in additional purchases of the 300 line/min band printer system by Code members seeking to multiply the output of their PDP-11s through printer upgrading.

"I knew that we needed to improve our output to meet our needs and use our PDP-11 efficiently," Arthur Cooley, president of Shoreland, said.

"Since we only have operators in-house and no in-depth DP technology, I began my search by going through an old copy of a computer publication, cutting out ads on used computer modules. I reached a systems house in New York which recommended SSI.

"I contacted SSI's Marketing Vice-President Jim Rule, who took a great deal of time on the phone to explain the differences in drum and band printers," Cooley said. "Our DEC computer vendor was offering a 300 line/min drum printer priced at around \$11,000. The purchase price for the band, a newer printer system, was about half that."

Additional Advantages

The price difference was a significant reason for Shoreland's band printer purchase — but not the only one.

"With the drum printer, replacement of the drum mechanism is much more expensive and requires outside technology in the replacement process. With the band system, changing the band is just like changing a typewriter

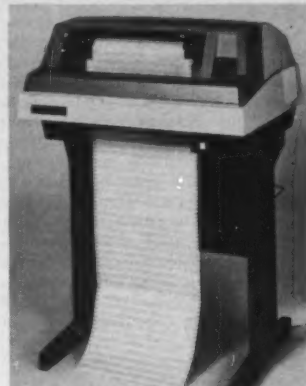
ribbon. It can be done by our operators and is much less expensive an item," Cooley stated.

Cooley said the ease in band-changing allows the company to convert quickly from a band with a capacity of 10 char./in. to 15 char./in. horizontally. Another feature is the switch-selectable 6- or 8 line/in. vertical spacing.

"If we're printing a report of a few pages, we use the band with the larger print. If we're involved in a report of 40 pages or so, as we sometimes are, the operator can change from one band to another within 10 minutes and we save a great deal of money in paper usage," Cooley noted.

The band printer's technology includes a diagnostic display. Other maintenance situations can now be handled in-house by Shoreland's operators without suffering the downtime and the expense of outside service.

"We did purchase a very reasonable, standard service contract as we would have with any other printer," Cooley said.



The B-300 Band Printer

"It was obvious, since both the DEC supplied drum printer and the SSI band printer offered us 300 line/min capability, that the band was the much better purchase."

An initial "occasional garbage line" with the 300 line/min band was eliminated after "a couple of visits by SSI technicians that never cost us anything extra," Cooley said. SSI provided an initial installation fee that guaranteed a working printer.

Word Spreads

Cooley spoke with a fellow member of Code who had a DEC printer on order for \$11,000. "When I told them what I'd found out, they canceled the order and went to SSI," Cooley said.

At a Code convention, he told other members about the band printer and several became convinced of the greater economy and usefulness of the band.

According to Joseph Horn, SSI president, end users as well as systems houses that get their printers through nontechnical distributors often face a "missing link" when it comes to technical support.

SSI is an independent evaluator, supplier and adapter of printer systems aimed at filling that service gap.

Scanning Aids Inspection

Bar Codes Change Course of Aircraft Parts

By Ann Dooley

CW Staff

LOS ANGELES — Hughes Aircraft Co. will soon begin using bar codes and scanning wands to record work steps completed on one of its assembly lines here.

The bar-coded identification routing slips that accompany parts through the assembly process are called Route Travelers. They will be printed in-house on enhanced versions of the company's two Printronix, Inc. Model P-300 dot matrix printers, according to John Besnard, technical director of software engineering.

Use of the scanning system at workstations and inspection points is expected to save a great deal of time, Besnard said, adding that although the bar-code system will not be in full-scale use until the second quarter of this year, testing has gone very smoothly so far.

Conversion Requirements

Before dot matrix printers could be used to produce bar codes, the machines had to be enhanced. With the attachment of a Magnum 300 device — from Quality Micro Systems, Inc., of Mobile, Ala. — the printers will output text, line and bar codes either vertically or horizontally, the software director explained.

The Printronix machines, printing at a speed of 300 lin/min and running at 9,600 bit/sec, are ideally suited for the conversion to bar-code use because these printers overlap dots and do not leave spaces. Besnard explained that bar codes need complete blacks and whites in order to be read.

Hughes also had to switch to special optical character-recognition ribbons since the new process is very abrasive. The old ribbons would have worn down quickly, Besnard said.

One problem encountered with the new ribbons is that output smears easily if handled too soon after printing.

Besnard believes, however, that since most of the bar codes will be batch-printed at night, the routing slips will have time to dry.

A few Route Travelers — used for special applications — will be printed on-line. A third P-300 printer will soon be obtained for that use.

Alternative Solutions

The Route Traveler system that will be discontinued uses long pieces of paper, attached to each part, to list the procedures needed before the part can leave the assembly line. An employee stamps the paper after each production step has been completed and sends the part and its attached paper on to the next workstation.

Time-consuming and awkward, the system requires each operator to walk from his station to a card-reader location in order to process a report on whether a part has passed that specific production or inspection point.

Having a card reader at every workstation would have eliminated the walking, but that solution was too expensive.

Besnard decided to use bar codes after an evaluation last year indicated that for price performance benefits, bar codes would be better than punch cards, magnetic strips or voice-data collection systems.

Under the new system, as a part passes, for instance, through the oven, the assembly line employee uses the scanning wand to read the individualized bar code on the Route Traveler. This reading activates the record and records the procedure in the system.

When in full operation, the system will consist of 85 bar-code reader-stations tied to a Hewlett Packard Co. HP 1000 CPU, linked in turn to an HP 3000 by means of its Computer-Aided Manufacturing Network (Camnet) developed in-house.

The HP 1000 is used to compile data

to enable Besnard to determine immediately the number of parts passing or failing inspection or even to locate an individual part if the need arises.

The HP 3000, located at the main computer center, is used to gather and store the data, primarily for backup and management reporting purposes.

The parts produced by the Hughes division are microcircuit electronics or hybrids used in radar equipment for the U.S. Navy and Air Force. Approximately 400- to 600 different parts need to be processed and inspected, amounting to thousands of individual parts, Besnard stated.

Besnard also said that he originally bought the printers several years ago because in his opinion, they were the fastest and offered high performance for the lowest price.

Meat Processor's Output Up

(Continued from SR/13)

ducing a label.

The printer is flexible enough, Elberson believes, to accommodate future applications — such as faster output rates — simply through the replacement of a programmable read-only memory.

Dinner Bell is not using bar codes on the labels at present, but plans to start using them in the near future as the market dictates. The Dataroyal printer has the capability of producing six different bar codes.

Backup System

The systems engineer said his company currently has one printer in its Cleveland facility but has ordered three more. One of the three will be placed in its Troy, Ohio, smoked meats plant to be used in a capacity similar to that of the Cleveland plant's printer. The other two will serve as backup units in both locations in case of a breakdown.

"We have 80 people on the produc-

tion line in Cleveland," Elberson explained, "and if the printer quits, the line quits."

Backup systems are also important during the monthly printer-maintenance period, especially in the Cleveland facility. During the month, the printer is subjected to almost brutal conditions within the plant, including low temperatures, relatively high humidity because of floor washdown (even though the printer is not in the highest washdown area — the meat cutting area), electrical noise and gum that flies off the back of the peeled labels.

Electrical noise that travels through ac power lines from conveyers and other electrical equipment in the plant can destroy equipment, Elberson said.

"Even without a noise decrier at first, the Dataroyal printer not only withstood the rough conditions, but was not affected by the noise," Elberson said. "We have been using it 98% of the time during an 8- to 9-hour shift, five days a week."

Printer Buyer's Checklist Assesses Real Needs

(Continued from SR/9)
my application?

Print speed may be important, but so may be print format. Printers are generally classified as having low, medium or high speed, and several manufacturers offer a range of products that cut across these lines. Data Printer Corp., for one, offers such a range and also markets horizontal moving-font line printers with band and chain-train mechanisms.

• *What are my choices in character sets, line widths, forms-handling facilities and so on?*

Most dot matrix printer manufacturers use the 64- or 48-char. Ascii set as standard. Larger firms also offer a variety of optional sets. In a dot matrix printer, the pattern of dots sets the size and clarity of the characters. Most units use a 5 by 7 pattern as standard, with 7 by 7, 9 by 9 and 9 by 9 as common options.

In line printers — which generally produce fully formed characters rather than letters composed of dot patterns — sets of 48, 64, 96 and 128 characters are commonly available.

Most printers produce 132 char./lin, either standard or as an option, spaced 10 char./in. Some manufacturers have recognized that this spacing creates an awkward-size output and are offering alternatives. The Data Printer Model 3300, for example, has a 15 char./in. condensed printing feature which allows narrower paper to be used.

Vertical spacing is normally six line/in., but the commonly available 8 line/in. option can reduce paper expenses by as much as 25% with very little degradation of readability.

• *What are some of the other significant considerations when selecting a line printer?*

In general, factors such as capability, reliability, price, print quality, operational simplicity and maintainability determine the real, overall value of a printer. Of these, print quality ranks at or near the top as a very important consideration.

• *Suppose time is not critical but number of copies needed is? Would I be more likely to use a serial dot matrix printer or a line printer? An impact or a nonimpact unit?*

Impact printers — with either dot matrix or line print mechanisms — can accommodate multipart forms, so they can produce copies "instantly." This is not true of nonimpact systems where extra copies must be generated serially on the printer or made by duplicating the original output on an office copying machine.

• *Suppose I start with a low-speed line printer and at a later*

date want to move up to a high-speed device. Are there any firms that manufacture both types?

Some vendors offer a full line of units ranging in speeds from 75- to 1,500 line/min.

• *There are no perfect printers. All of them require service and maintenance sooner or later, so what should I look for?*

A well-designed printer will be easily maintained and re-

quire infrequent service. Look for a design that allows the

changing, paper loading and routine house-cleaning.

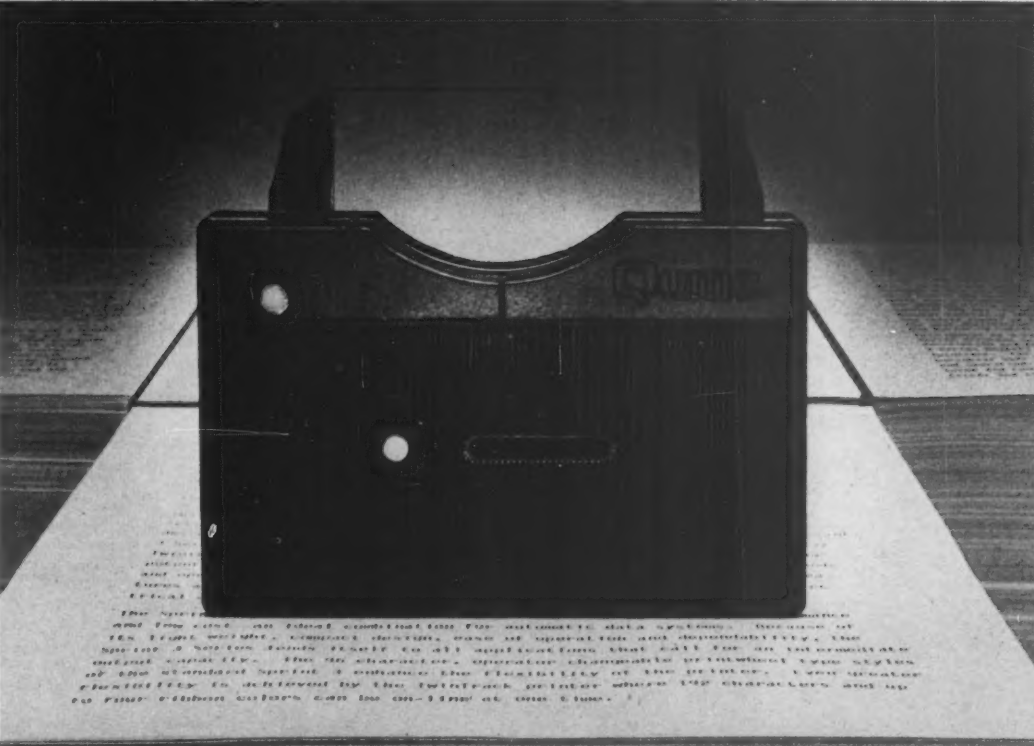
'An operator should not have to make machine adjustments to keep the printer in operation. The printer should be designed with simplicity in mind — all major subassemblies should be constructed to minimize the mean time to repair.'

operator to perform such non-technical tasks as ribbon

An operator should not have to make machine adjustments

to keep the printer in operation. The printer should be designed with simplicity in mind — all major subassemblies should be constructed to minimize the mean time to repair. Possible labor costs and system downtime are major factors to consider in any printer purchase.

Henry is vice-president of marketing for Data Printer Corp. in Malden, Mass.



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Vendor Sees Trouble Ahead for Some Printer Market in '85: Electronics to Dominate

By Tom Henkel

CW Staff

HORSHAM, Pa. — Five years from now, printers will be two-thirds electronic and one-third mechanical — as compared with their current state of being basically mechanical machines with a little electronics. Although there will not be any revolutionary breakthroughs in the printer business, the market will do a flip-flop in the next five years, in one vendor's opinion.

As CPUs get cheaper and more sophisticated, printer vendors will be under increased pressure to produce innovative hardware at near bargain-basement prices. One such vendor, Decision Data Computer Corp., is already feeling the cost-plus pinch and is trying to fight back.

Making and servicing printers — among the last electromechanical holdouts in the high technology field — involves high costs. There is not much hope of bringing those costs down in the near future, according to Kenneth R. Whitehouse, Decision Data's vice-president of business planning.

Changing Technology

For Decision Data — one of the largest suppliers of IBM plug-compatible printers — the push for better and cheaper machines feels more like a neat-so-gentle shove. The firm must find a better way of making

its printers print just to keep up with IBM's rapidly changing technology. Keeping up with IBM's unsurpassable research and development budget is an unthinkable option. Getting out of mechanics and going more heavily into electronics is Whitehouse's answer to the changing technological scene.

"The nonimpact electrophotographic printer offers the greatest opportunity for better performance and higher quality output at a wide range of speeds — and at good prices," he said.

Whether their machines are big and fast or little and not-so-fast, Whitehouse said, most plug-compatible vendors will be thinking electrophotographics for the next five years.

"You'll see speeds anywhere from two or three pages per minute clear up to 120 pages per minute." Electrophotographic printers will run the gamut from "very expensive machines to low-cost convenience output printers on terminals," Whitehouse explained.

New Printer in '81

For the near future, Decision Data plans on taking a middle-of-the-road approach to electrophotographic printers. It has on the drawing board a 24 page/min machine aimed at medium and small system users.

Slated for release in the first half of 1981, the Decision Data printer —

which has yet to be given a name — will be directed at users having both word processing and data processing needs.

"The word processing environment will be a ready market for electrophotographic printers because you'll be getting correspondence-quality output at much higher speeds than today's daisy wheel can offer," Whitehouse

'Making and servicing printers — among the last electromechanical holdouts in the high technology field — involves high costs. There is not much hope of bringing those costs down in the near future.'

noted.

Although Decision Data is anything but out of the matrix and daisy-wheel printer business at this time, Whitehouse said, firms that don't switch to electrophotographics in the next five years will be in big trouble.

Expensive Maintenance

While electrophotographic printers may be faster and cheaper, anyone who has owned a copying machine knows the electrophotographic portion also breaks down frequently. That thought sends chills down many vendors' spines. In a business where maintenance calls have a dramatic im-

pact on the price of hardware, the push for lower peripheral prices could turn out to be an all-out brawl.

However, Whitehouse seems to take an optimistic note.

"This technology won't solve our basic problem where maintenance is quickly becoming disproportionate to the cost of hardware. We'll just have to bite the bullet and realize that [users]

are buying something that [won't] just sit there. It's going to do a job. And it's going to break down, and expensive labor is going to have to fix it.

"It's theoretically possible that maintenance costs will exceed the costs of equipment. But I don't think it will go that far. As we get more electronic contents, the reliability will increase. My personal feeling is on a per character or per line basis, the maintenance requirement will decrease," Whitehouse said.

IBM's Role

The next five years will also take their toll on peripheral vendors. Some will move from biting the bullet to biting the dust. Still others will spring into the market and flourish.

Much of that success or failure depends on IBM, one of the clear innovators in hardware technology.

With its unsurpassed R&D budget, IBM may seem an unbeatable foe in a footrace to peripheral profits. Whitehouse insists — rather dutifully — that Decision Data and IBM are friendly competitors. He somewhat reluctantly admits, however, that turning a profit in the IBM plug-compatible market is getting tougher.

As an example, Whitehouse cited problems his firm had in figuring out where to attach its printers to IBM's System/34. Decision Data could not break IBM's secret microcode to put line printers in the place normally set aside for them. It had to devise its own way of putting the line printers on the place set aside for CRT terminals, workstations and serial matrix printers.

Heavy Testing

"We had to go through a lot of design and testing to understand how to put a high-speed line printer out there on a 120-character matrix." And that design and testing eats into profits, he said.

Decision Data is already starting to feel the pinch in the area of electromechanical printers. The firm has been forced to shy away from some OEMs for electronic circuitry because the costs are getting too high to be profitable.

The alternative this company chose was to design and manufacture its own circuitry, which saved Decision Data from developing interfaces to adapt OEM products. Whitehouse feels the change may give the company an upper hand in the rough years to come.

From \$6 to 75 Cents per 1,000 Pages Report Shows COM Sharply Cuts Costs

DELRAN, N.J. — Computer output microfilm (COM) has become a money-saving output method for many printing operations, according to a report from Datapro Research Corp. entitled "All About Computer Output Microfilm."

It costs the average user about \$6 to print 1,000 pages of output on paper. The COM user, however, can produce the same number of pages for about 75 cents, Datapro said.

Similar savings in handling, distribution and storage costs are also available with COM, the report stated.

A 1-oz., 4- by 6-in. microfiche, for example, can hold the equivalent of 10 pounds of computer printout.

Not for Everyone

But COM isn't right for every application. Information that needs to be read and studied for management decision making is probably best put on paper, the report said.

COM is most effective for the DP manager with a monthly volume of report production of more than 500,000 pages. This is particularly true if specific special formats are required or if storage space is limited for filing paper copies of reports and lengthy distribution lists.

Once the internally distributed output volume approaches one million report page/mo, a paper-based information system is wasteful, the report stated.

Considering setup time and maintenance, the impact printer can produce about 175,000 page/mo. A user would need a second shift to go to 350,000, the report estimated.

A COM recorder that prints only 10,000 line/min can produce more than one million frame/mo in one shift.

If multiple impact printers are needed to print high volumes of output and only one COM system can produce this same volume without another shift, then COM should be considered, the report indicated.

Low-cost COM printers have the same restriction as line printers. They print only one font and are limited to 64 line/page.

However, more sophisticated models

'COM isn't right for every application. Information that needs to be read and studied for management decision making is probably best put on paper.'

are available that offer many fonts, underlining, scripting, several sizes of print, several intensities, rotated text within a given frame and graphic plots.

A standard heading can be projected on the frame area by flashing a high-intensity light through a photoengraved glass slide, the report noted.

COM printers can also add page retrieval codes to each page of microfilm. With these codes, reader operators can find the desired information within seconds.

COM Disadvantages

On the other hand, the report pointed out several COM disadvantages.

COM is incompatible with fast-changing data bases, such as in an airline reservations or inventory application, and updating COM necessitates reprinting an entire reel or an entire fiche.

Because COM is film, not paper, the user cannot make notes, flip through COM or make notes on the pages. COM cannot be used, without a reader.

Furthermore, both recorders and readers sometimes need adjustments to maintain image clarity and optical alignment.

Microfiche also provides poor file integrity because it is easy to mistakenly remove one fiche or card without having its loss detected.

With regard to an in-house system, a COM recorder is an expensive investment. To justify it, a user needs a high-volume workload.

What About Software?

As for software, the user may often have to create two versions of his print tapes, one formatted for the COM unit and another for the line printer in case of COM unit failure.

The report further stated that large program libraries may have to be modified to convert printer output tapes to effective COM input tapes. Main-frame operating systems may also have to be modified.

Finally, staff members must learn to use the system both inside and outside the DP shop.

The report, No. 70D7-010-80a, is available from Datapro at 1805 Underwood Blvd., Delran, N.J. 08075.

On-Line COM Peripheral Unit Coming of Age

Special to CW

Computer output microfilm (COM) is recognized as one of the most efficient and least expensive methods of printing, distributing, storing and retrieving computer-generated data. COM can be especially valuable when incorporated into a complete data processing system. The on-line COM device can function as a conventional on-line printer, receiving data directly from the host CPU.

Software alternatives enable the user to assign COM formatting to the existing host computer software or to the on-line unit's minicomputer. The latter method relieves the host computer from formatting responsibilities, freeing it for other forms of data processing.

The flexibility afforded by both host and minicomputer software, as well as sophisticated developments in COM hardware, have contributed to renewed interest in on-line COM. This has caused many DP professionals to reevaluate their output requirements.

Why On-Line COM?

The increase in the popularity of on-line COM has given rise to questions as to why more and more users are turning to this method of microfilm production. Several Datagraphix, Inc. users cited their reasons for deciding to go with on-line COM.

At Fulton Federal Savings & Loan Association in Atlanta, quick turnaround was an important factor. Prior to converting to an in-house COM operation, Fulton Federal was working with a COM service bureau to generate many of the bank's reports on microfiche.

However, because of the bank's strict deadlines, the decision was made to evaluate several vendor's COM products and to install a system in-house. A Datagraphix On-Line Autocom II was selected on the basis of the quality of the microfiche, the reliability and serviceability of the hardware and the flexibility of the software. The Autocom II produces cut, dry microfiche within minutes after the data is transferred from the bank's IBM 370 host CPU.

At first, many existing COM jobs were converted for production on the Autocom II, resulting in a substantial reduction in service bureau costs. Since installing the new unit, additional time and money has been saved by increasing the number of smaller applications, and by adding a major one.

Programmers are now producing program listings, updates and system dumps on microfiche instead of on paper. This eliminates the need to wait for the printer to generate paper output, an especially critical problem during end of the month and quarterly "crunches."

Tom Vaughn, manager of computer operations for Fulton Federal, was responsible for introducing microfiche to the bank's programming department. He explained why he believes it was an important step toward his goal of improving the group's overall productivity.

"Programmers here at Fulton come in first thing in the morning ready to go to work. If program listings are not available until 10 or 11 a.m., they are wasting valuable time just waiting. If the printer is tied up, or if the service

bureau can't deliver the microfilmed listings before working hours begin, productivity suffers. With the On-Line Autocom II, listings, dumps and so forth are all available within minutes.

"Although we don't have a large programming staff," Vaughn continued, "we were wasting the equivalent of a programmer a day due to 'wait time.' That added up to money!"

Quick Turnaround

Quick turnaround was also an important factor at Computerized Automotive Reporting Services, Inc. (CARS), a Birmingham, Ala. company specializing in the automation of operations and systems for car, truck and heavy equipment dealerships. At

CARS, immediate access to up-to-date information was critical to its operation as a service company.

CARS offers a variety of services that include inventory control, payroll, general accounting — everything necessary to help an auto dealership automate its operations.

"Serving our customers is the primary concern at CARS," according to Don Bensen, manager of computer operations. "We have a very extensive and growing customer base in this country, and international operations in Canada, Japan and Australia serving other key customers."

"We have over 75 people working in four different customer service areas, all of whom are responsible for answering inquiries throughout the

day." These queries often concern figures that appear on periodic reports, Bensen explained.

"If it were necessary for these employees to respond to every call by searching through stacks of computer printouts for answers, a huge backlog of work would pile up and we would have some irate customers! No one wants to wait four or five hours for an answer."

"With microfiche, current, easy-to-read information is at each employee's fingertips within minutes, and response time is reduced to just a minute or two. COM is a necessity at CARS, and on-line COM has enabled us to further improve our customer relations," Bensen said.

(Continued on SR/21)



Could be — unless you keep up with this ever-changing market with our March 31st Special Report, **Data Communications Terminals**. Like Computerworld readers, data communications terminals are becoming even more intelligent. This means a wider range of functions and greater flexibility of applications for the end-user — large and small. It all adds up to less cost — or does it?

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Next Best Thing to Portable Terminal COM Takes Care of Sales for Hospital Supplier

Special to CW
EVANSTON, Ill. — When a health care products sales representative is dealing with a busy professional, fast, accurate information on products is vital.

For 1,800 salespersons servicing the medical field for American Hospital Supply Corp. (AHSC) here, a single envelope containing five 4-by-6-in. cards is the next best thing to having a portable computer terminal in their attache case.

Microfiche cards, viewed on a compact reader, each contain the equivalent of more than 200 pages of computer reports, listing the latest price and availability of AHSC's various product lines. These can range from bed sheets to valves for open heart surgery and include precision dental equipment as well as complex, state-of-the-art respiratory therapy monitors.

Micrographics Reports

The widely distributed price and availability report is just one of nearly 300 reports issued weekly, monthly or quarterly by the micrographics department of AHSC's management services center in McGaw Park, Ill. In a recent month, the unit generated 61,000 original microfiche and made more than 400,000 duplicates for distribution to 18 AHSC divisions.

"Virtually all of the computer reports output to paper are also printed directly to microfilm using computer output microfilm (COM) technology," James R. Johnson, micrographics supervisor, reported.

In addition, he said, certain reports which must be distributed widely on short deadlines are printed only in microfiche form. The price and availability reports and a large "month to date invoices" report are examples of the latter.

"The price and availability report, which often had more than 1,000

microfilm reports are produced, COM serves as an important backup. Even AHSC's massive array of impact printers gets backed up with work overloads, and users frequently receive their microfiche copies before the paper versions are available.

The microfiche gives them something

'A federal regulatory agency found that one supplier had been overcharging its customers — including American Hospital Supply. By accessing six- and seven-year-old microfiche computer reports, the company was able to reconstruct the amount of business it had done with the vendor and apply for a refund.'

to work with immediately, and serves as a further backup to provide recent data when on-line transmission to remote terminals isn't possible. "Microfilm has replaced paper for archival storage at a space savings of more than 90%, Johnson said. He cites one case in which a federal regulatory agency found that one supplier had been overcharging its customers — including American Hospital Supply. By accessing six- and seven-year-old microfiche computer reports, the company was able to reconstruct the amount of business it had done with the vendor and apply for a refund.

Continuous Operations

American Hospital Supply's COM needs are serviced by an efficient department that consists of only eight full-time and two part-time workers. Their efforts are spread over three shifts, seven days a week. To underline the importance of continued operations, Johnson pointed out that Christmas 1978 was the only period allotted for a scheduled shutdown in recent memory. It was a series of involuntary down periods that led to a recent upgrading of equipment and systems within the department.

"Our older-style COM unit was be-

had taken 88.9 seconds to generate one fiche on our old machine. We were offered a later model that would do the same job in 51.5 seconds," Johnson said. "But the 3M unit was able to trim the time to 37.1 seconds after minor programming changes."

Johnson also liked a new, faster com-

mand console that had been added to the unit and an extremely rapid dual-diskette drive. The machine's ability to be upgraded to the 3M System 715, using Dry-Silver processing, was also important.

"We had no plans to eliminate our wet processing, but didn't want to be locked out of any future options," Johnson pointed out.

AHSC added two of the 3M System 710 units in a transition that Johnson described as "little more than plugging them in and running."

'Software changes . . . will allow the COM units to print a bar code indicating the number of duplicates directly on the original fiche. An upgraded microfiche duplicator will read this bar code and generate the proper number of copies automatically.'

The move was an important step in a continuing program of streamlining the micrographics operations. The master plan was drawn up in the early 1970s by Ron Kostrzewa, AHSC manager of production and control.

The computer and micrographics facilities are housed in a sturdy, windowless structure that is rated as nearly natural disaster-proof. Two Burroughs Corp. 7700s and a Burroughs 4700 CPU are located above the micrographics department. As tapes are generated for output, they are sent down to the control department via a dumbwaiter. There, they are sorted and routed either to the micrographics department or the printer department for output.

As Johnson's workers log in the tapes, they are given priorities, depending on the turnaround time needed. Mounted on the 3M COM microfilmers, each original microfiche is exposed directly onto sensitive microfilm.

The exposed microfilm is processed in a recently added high-volume film processor. The unit features wash tanks after each chemical to help eliminate contamination through carryover, larger tanks and a thermostatic control for all five processing chemicals. The result, Johnson said, is high-quality microfiche with excellent contrast and maximum density for optimal legibility.

Manual System Preferred

Though automated equipment is available for cutting and separating microfiche, Johnson said he prefers his department's manual system.

"Our trained operators are able to

visually inspect every microfiche as it passes over a light box," he pointed out. "Not only are they able to spot obvious defects such as scratches or static markings, but they can detect problems within the frames themselves. A microfiche viewer is mounted at their work table so that the fiche can be inspected further and confirm that, for example, a problem with the software exists."

The microfiche originals then are logged into a distribution book, which indicates what division gets the fiche, how many copies they want and the addresses to which each is sent. The distribution book also forms the basis for charging back to the divisions for they receive each month.

Three duplicators produce diazo copies, which are sorted, using the distribution book, into pigeon holes. Printed labels are applied to the envelopes used to route the fiche to the relevant departments all across the U.S.

The original microfiche are acid-alphanumerically and placed in filed-free sleeves for archival storage if they will be retained longer than 90 days. The tapes are racked for return to the computer library.

Johnson said he foresees a number of improvements in this already-efficient system. One important change will come in the method used for reporting the status of jobs to the users.

At present, the department's workers have to answer frequent phone calls from users wanting to know where their reports are. These will be eliminated once AHSC adds several on-line terminals in the micrographics department. These will be used to enter the status of the microfiche reports as they are received and completed. The operations department will be able to access this information directly through their own terminals to determine a report status.

Last-Minute Changes

At this point, the users will be able to make changes in the number of copies needed and locations included in the distribution of each report directly. Currently, Johnson's crew makes about 2,000 distribution changes a month. Under the proposed system, the users will enter the changes themselves at the computer terminal.

Software changes contributed by 3M will allow the COM units to print a bar code indicating the number of duplicates needed directly on the original fiche. An upgraded microfiche duplicator will read this bar code and generate the proper number of copies automatically.

Similarly, the computer-printed distribution book will have the relevant changes included automatically to reflect new distribution patterns for the affected fiche. One time-consuming weekly chore will be eliminated entirely.

'In applications where both paper and microfilm reports are produced, COM serves as an important backup. Even American Hospital Supply's massive array of impact printers gets backed up with work overloads, and users frequently receive their microfiche copies before the paper versions are available.'

pages, couldn't be printed and mailed on the weekly schedule that makes it most useful," Johnson pointed out. "Mailing costs, and the handling required by such a report, made it too costly to distribute on a less frequent basis."

Instead, he said, the report is output to microfiche off-line, and the required number of duplicates made quickly by automated machinery. The reports can be mailed first class for a few cents' postage each.

Backup, Archival Use

The net result for AHSC is the availability of low-cost, compact microfilm computer reports for both backup and archival purposes and enhanced information distribution capabilities in applications where paper reports had been too bulky or costly and time-consuming to distribute in the past.

In applications where both paper and

coming increasingly difficult to maintain," Johnson recalled. "It was inoperable for an entire weekend at one point — the worst possible time for us. Because of the large number of weekly reports we receive on Friday afternoons, weekends are our peak periods."

"It seemed obvious that we needed to upgrade to a more modern and reliable computer-output-microfilmer. We felt that we could gain some needed speed as well," Johnson explained.

Shopping Around

The company looked at models produced by several manufacturers, which included the 3M Co. System 710. The greater speed of the 3M COM system made the difference, according to Johnson.

"We benchmarked several jobs on our old machine, a newer model and the 3M system. In one application, it

Levi Strauss Cuts Sales Data Down to Size

Special to CW
SAN FRANCISCO—When Neil Diamond sings "Forever in Blue Jeans," he is addressing a fashion phenomenon. Jeans have been a part of American life since the Gold Rush days, and for nearly a century one name has been synonymous with denims: Levi's.

In its 130 years of manufacturing jeans and other fashions for men and women, Levi Strauss and Co. has grown to a \$2 billion-a-year business, employing nearly 42,000 people. Two billion dollars represents a lot of apparel, and sales of that volume represent a lot of paperwork.

For the company's corporate headquarters staff here, the paperwork had turned into a nightmare that seemed to grow worse each day until a decision was made to convert the majority of sales reports from printed paper to computer output microfiche (COM). Since the recently completed conversion, sales data output has increased tenfold.

According to Customer Service Manager Ernest Garcia, the conversion has saved the company both time and money. "To give you just one example, we turn out a 50,000-page month-end sales report each month for our people in the field," he said. "That used to take about 50 hours just to print, then we had to have multiple copies made."

Forty Applications

Levi Strauss' COM conversion began in August 1979, when the company installed an NCR Corp. 643-118 minicomputer-controlled COM recorder/processor and a duplicator. Since that time, some 40 applications have been transferred to the new system. In addition to the month-end report, daily invoices, credit memos, picking ticket summaries, monthly and quarterly lot reports and geographic listings are now among the COM applications.

"For the time being, our conversion

is complete," Garcia said, adding that in the future, he'd like to see all documents of 200 pages or more transferred to COM.

Levi Strauss is no stranger to COM, having employed a service bureau to produce legal and historical reports for about eight years prior to purchasing an in-house system.

"Using the service bureau helped us make the decision to convert our sales output to COM," according to Gladys Johnson, project leader of the COM conversion. "This technology makes a lot of sense—it's clean, fast and allows you much more control of the data than paper."

In-House Conversion

Once the decision had been made to have a COM system in-house, a detailed selection process followed. According to Johnson, all of the major COM suppliers were contacted. The field was then narrowed down to three, including NCR. A team of em-

ployees, all of whom would be involved in the COM conversion, were recruited to evaluate each company's system.

"We were looking for quality fiche, a good software package and a reputable service organization," Johnson said. "NCR came out in front with everything we needed."

NCR is the only total computer system company to offer micrographics, and the 643-118 featuring job format storage, is its top-of-the-line COM recorder/processor. The software package accepts a variety of print image, spool, or COM-formatted tapes as input.

The transfer of data from tape to fiche is a fast, simple process. The data comes up on a CRT inside the processor and is recorded in sequence on 105 mm microfiche. The microfiche is then cut and developed within the processor and comes out ready to be displayed or duplicated. Since the process is minicomputer-controlled, there is no need to use the company's large computer for COM production.

According to Computer Room Manager Axel Schloss, between 16 and 28 fiche are created from each tape, depending on the amount of data contained on the tape. Each 4-in. by 6-in. fiche can handle the equivalent of 207 pages of information.

"Before we went to an in-house system, our applications were necessarily limited," Johnson said. "Now that the system has been in operation for six months, I can envision a time when we will be operating the COM room 24 hours daily, everyday." Currently, COM operations take only about 20 hours a week, producing 1,000 fiche and 2,000 duplicates.

On-Line COM Device Coming of Age

(Continued from SR/19)

CARS has utilized on-line COM since 1974 when it began producing 16mm roll microfilm. The company installed a new Datagraphix On-Line Autocom II and replaced 16mm roll film with the more convenient and less costly microfiche. The Autocom II, linked directly to an Amdahl Corp. V6 Mod 2 CPU, utilizes a 32K-byte microcomputer system to provide intelligent on-line operation at speeds up to 13,000 lines per minute.

Data is processed into fully titled and indexed microfiche, a capability not available with the company's previous on-line system. This capability to format data has allowed programmers at CARS to tailor output to their own user specifications.

At this time, microfiche is used exclusively in-house, with the largest volume of fiche distributed regularly to an extensive customer service network.

Ease of Conversion

Converting from the company's roll film recorder to the Autocom II was a simple process, Benson commented.

"I was surprised at the ease of conversion. The person designated to implement the conversion had never seen a microfiche, although he knew what one was. Within two weeks, 50 to 60 jobs were ready for production on the Autocom II," he added.

Since its installation, more and more applications have been added. Just as at Fulton Federal, programmers are now given the option to receive much of their work on microfiche instead of paper. Benson is especially interested in increasing this department's use of film, as costs continue to soar.

"I spend over \$150,000 on paper for our 50 programmers each year," Benson explained. "This is a large expenditure that must be reduced. I intend to do this by encouraging programmers to accept microfiche as an alternative to paper for their program listings and system dumps."

Tapes Eliminated

Although quick throughput is a major factor in some users' selection of an on-line device, another factor is the elimination of computer tapes. At Brown Co. of Kalamazoo, Mich., space was at a premium.

This national producer of paper products and building materials made the transition to COM several years ago and realized tremendous space savings. Almost 200 filing cabinets were gradually phased out and replaced with several notebooks and file drawers of microfiche.

Additional space savings were realized by installing an Autocom II. Tape storage was virtually eliminated, since the computer data is fed directly to the COM recorder from the host IBM 370 CPU.

Brown Co. is no longer required to store its tapes for long periods of time just in case an important report is lost or destroyed, as this information may be easily retrieved on film, according to Gib McGuire, operations manager at Brown Co.

"We had a real storage problem, and I was looking for a way to maximize the little space we did have. COM proved to be a tremendous asset, and the on-line unit freed up additional working space," McGuire said.

Just as there is a variety of reasons for replacing paper output with microfilm, there is a variety of reasons for choosing on-line COM. Since on-line COM recorders can operate in a variety of DP environments, computer

output microfilm can now be readily adopted as a peripheral device within the computer environment. An on-line system can assist in streamlining operations and at the same time improve the data output rate. In addition, on-line COM offers all of the same benefits as an off-line system.

Before selecting any COM system, it would be worthwhile for every potential COM user to evaluate his own particular data output needs and seriously consider on-line COM as a potentially valuable asset to any data processing operation.

High-Speed Line Printers Handle Specialized Needs

(Continued from SR/13)

A publisher of standard reference works for attorneys and certified public accountants uses two 600 line/min CT 4964 Chaintrain printers with upper and lower case to update those tomes.

According to David Hurst, vice-president of manufacturing and data processing for Callaghan & Co., one such work is the 50-volume *Mertens Law of Federal Income Taxation*.

"The typical volume may contain more than 100,000 lines of text or some five million characters. A single volume can exceed the storage capacity of the normal word processing system. Since we handle many volumes at one time and publish over 100,000 pages a year, we have chosen to use a computer for producing many of these pages," Hurst said.

The printers are driven by a 512K-byte Data General Corp. Eclipse minicomputer.

"The speed and quality of these printers," according to Hurst, "allows us to produce millions of lines a month, representing a tremendous amount of technical processing. We're using the Chaintrains for all intermediate text processing and proofs preceding the final phototypesetting operations."

"And, although we can keep up with

the current work flow, we're considering upgrading to 1,000- or 1,200 line/min printers to double our throughput with the same number of Chaintrain printers."

No serious problems have been encountered in their two years of operation, according to Hurst, and maintenance is described as "normal and routine" by Callaghan officials.

OEM Prices

Digital Associates buys printers from several manufacturers at OEM prices. Digital Associates Corp. manufactures compatible controllers and packages them in the printer for a variety of computer systems so that the Digital Associates' printer is transparent to the buyer's operating system. Users often save up to 50% over medium-speed models from Digital Equipment Corp. or other mini and small business systems vendors, the company said.

Features have also been added to the Digital Associates' product line that will contribute to operator convenience and ease of training, including software compatibility and diagnostic tests and procedures. The tests allow all printer functions to be exercised off-line for ease of maintenance and fault isolation.

Digital Associates is located at 1039 East Main St., Stamford, Conn. 06902.



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Part 5: Throughput

SURVIVABLE SYSTEMS

The system we have described so far may seem a programming panacea. Applications can be built to support many simultaneous users (multiuser), run concurrently with and independently of any mix of other tasks (multitasking) and make use of any resource available anywhere in a multiprocessor network, without ever being aware of these functions. And with a little forethought and virtually no additional effort, the application may be made virtually fault tolerant; a failure of any component in the system, including any processor it is using, will be transparent to the users.

However, this power does not come without penalty. The operating system that accomplishes this is very big and requires a good bit of the system's resources. The result is a loss of the raw capacity of the system so far as the application is concerned. Whether or not this loss is significant depends in part on the application and in part on how smart we are in how we use the system.

Our description of processes and how they are managed provides the tools we need for understanding the bottlenecks in the system, analyzing their impact quantitatively and finding ways to improve the system performance. In this part, we will use these tools to analyze the implementation of an application and show that additional software effort can be traded for system capacity (and equivalently for hardware cost). This gives us the final tool for determining the most economical system in terms of hardware/software cost trade-offs.

Queuing Process

There are two important characteristics of interest to the user so far as throughput is concerned — capacity and response time. Capacity is the number of transactions the system can handle in a unit time (typically, transaction/sec, where a transaction is used in a general sense defined by the application). Response time is how long a user must wait from the time he has entered a transaction to the time he has received a response.

These two parameters are directly related. As one imposes a greater load on a system (increases the number of transaction/sec), the response time increases (the system becomes more sluggish). The load at which the response times become marginally acceptable represents the usable capacity of the system. This will generally be less than the raw capacity of that system; that is, loading a system 100%

will usually produce unacceptable response times.

The reason the system slows down is a phenomenon called queuing. Just like at a bank or a tollgate, as the rate at which people or cars are arriving increases, a line forms. We must not

This is the last installment in a five-part series.

only wait for the teller or toll taker (the "server") to service us, we must also wait for him to serve everyone in front of us.

The simplest case of queuing is for a single server (only one toll gate open). This is typically the case in a computer system — only one processor is going to provide a given function for a given user. Several processors might be involved as the processing of a transaction proceeds from one step to the next, but the transaction does not have a choice of several processors from which it can pick the least loaded (though such a multiserver system is conceptually possible and a powerful approach to wringing more capacity out of a multiprocessor system).

Let us look at the rather simple relation between response time and load-

ing for a single server. This relation will become pivotal in our analysis of system throughput.

In Figure 5-1, a server is servicing a line of waiting transactions. On the average, it takes the server T seconds to service a transaction. Some take more, some take less, but the average is T ; T is called the "service time" of the server. The average length of the line, which we will call "queue length," is Q transactions. This comprises W transactions waiting in line plus the transaction (if any) currently being serviced. Finally, transactions are arriving at a rate of L transaction/sec; L is the "load" on the server.

The server is busy, or occupied, LT of the time (if transactions are arriving at a rate of $1/\text{sec}$ [L] and the server requires $.5 \text{ sec}$ to service a transaction [T], then it is busy 50% of the time). This is called the occupancy of the server, 0 :

$$0 = LT \quad (1)$$

0 also represents the probability that an arriving transaction will find the server busy. (Obviously, if the server is not busy, there is no waiting line.)

When a transaction arrives to be serviced, it will find, on the average, W transactions in front of it waiting for service. With probability 0 , it will also

(Continued on In Depth/2)

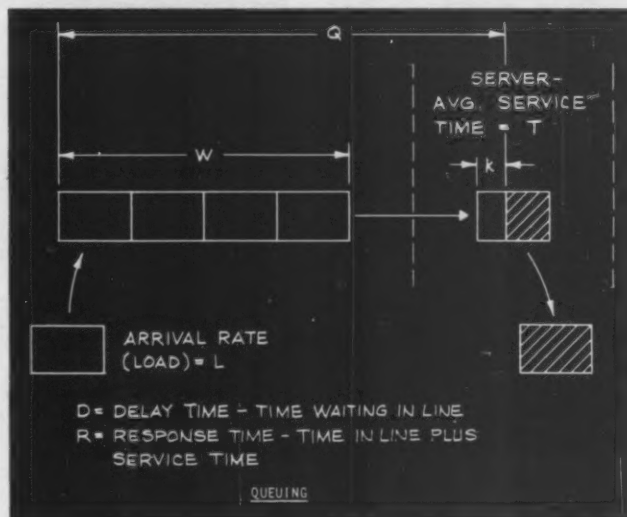


Figure 5-1

By Wilbur H. Highleyman

IN DEPTH

(Continued from In Depth/1)
find a transaction being serviced. The servicing of the current transaction, if any, will have been partially completed; let us say that only kT time is left to finish its servicing.

The newly arrived transaction will have to wait in line long enough for the current transaction to be finished (kT seconds 0 of the time) and then for each transaction in front of it to be serviced (WT seconds). Therefore, it must wait a time D (the delay time) be-

fore being serviced of:

$$D = WT + 0kT \quad (2)$$

Once its servicing begins, W other transactions must have arrived on the average to maintain the average line length. Since transactions are arriving at a rate of L transaction/sec, then:

$$W = DL \text{ or } D = W/L \quad (3)$$

Setting (2) and (3) equal and solving for the waiting line length, W , gives

(using (1)):

$$W = \frac{k\lambda^2}{1-\lambda} \quad (4)$$

The total length of the queue as seen by an arriving transaction is the waiting line, W , plus a transaction being serviced 0 of the time:

$$Q = W + 0 = \frac{k\lambda^2}{1-\lambda} [1 - (1-k)\lambda] \quad (5)$$

This looks a little messy, but let us look at k , which is the portion of the

current transaction yet to be serviced. We could take a worst-case stance and say that the servicing of the current transaction has just begun when a new transaction arrives. Under this assumption (except for some unlikely service time distributions), $k = 1$.

This is equivalent to the more precise and conservative position that the service times are randomly distributed with mean T , since in random distributions (exponentially distributed service times), the time to finish, given any starting point in the service cycle, still has a mean of T . For constant service times, on the average half of the service would be completed, and $k = 1/2$. The average queue is then smaller:

$$Q = \frac{\lambda}{1-\lambda} \left[1 - \frac{\lambda}{2} \right]$$

Khintchine and Pollaczek have shown in general that:

$$k = \frac{1}{2} \left[1 + \left(\frac{\text{standard deviation of } T}{\text{mean of } T} \right)^2 \right]$$

The standard deviation of a random distribution equals its mean; the standard deviation of a constant service time is zero.

Equation (5) then becomes:

$$Q = \frac{\lambda}{1-\lambda} \quad (6)$$

The response time R is determined in a manner similar to the derivation of Q . The response time R is the total amount of time the transaction must wait in the queue — waiting in line and being serviced. While the transaction is in queue, Q transactions must arrive to maintain our steady state:

$$Q = \lambda R = \lambda Q/T \quad (7)$$

Setting this equal to (5) and solving for the response time R gives:

$$R = \frac{1}{1-\lambda} [1 - (1-k)\lambda]T \quad (8)$$

For $K = 1$, (8) becomes:

$$R = \frac{1}{1-\lambda} T = \frac{1}{1-\lambda} T \quad (9)$$

This is the queuing equation commonly used to account for system degradation as queues build up. Equation (9) is plotted in Figure 5-2. From this curve, we can see that the response time rises slowly with load until about 70% loading, at which point it quickly degrades. A further 10% increase in load causes a 50% increase in response time; a 20% increase in load increases the response time 200%!

Therefore, we would like to stay away from this knee of the curve. It is good design practice to limit the peak average load on a system to 50% to 60% so as to accommodate reasonable instantaneous peaks; we will use 60% in our examples.

Service Time

From equation (9) we can see that the service time is the only factor determining the response time of a system under a given load. Therefore, we must be able to determine the service time of a transaction flowing through our application.

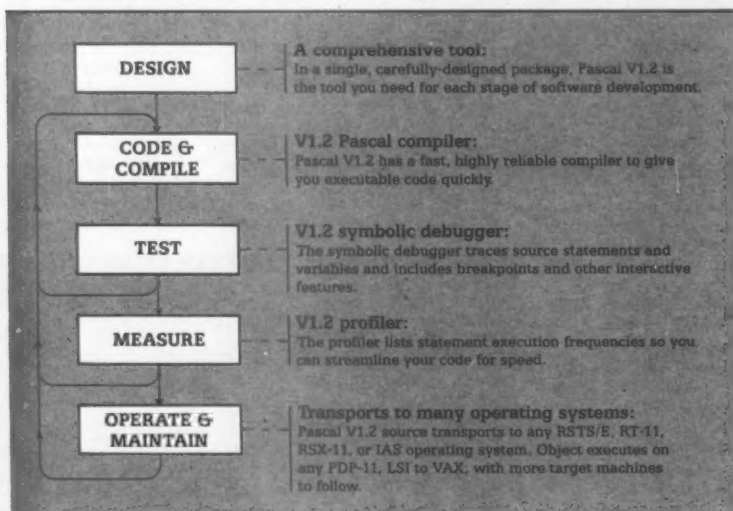
Fortunately, the bounded nature of the process makes this fairly straightforward. Typically, a process receives

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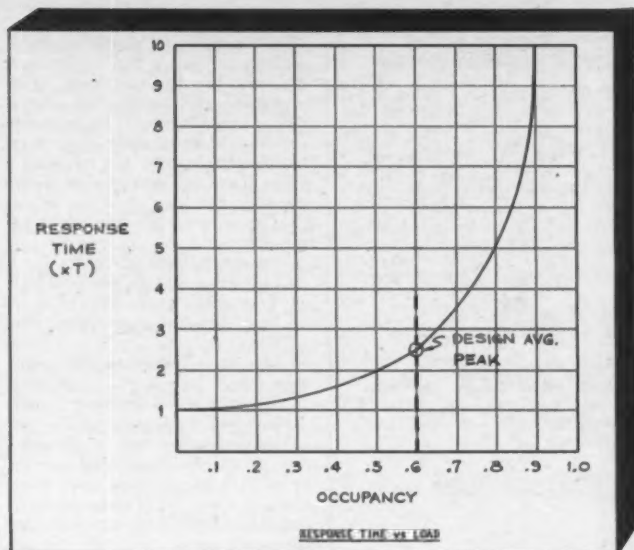


Figure 5-2

an interprocess message, processes it and returns a response. It may send one or more messages to other processes, but these can be counted as received messages by these other processes for loading purposes.

In order for a process to perform its function, three distinct actions must be performed by the system and the process, each of which requires a process time of:

- t_m — Send a message to a process and optionally receive its response (message time).
- t_s — Schedule and turn on the process (process switching time).
- t_p — Process the message by the process (processing time).

Thus the time required by a process to perform its specific function is:

$$t = t_m + t_s + t_p$$

Message time is a function of message length, whether or not the processes are in the same or different processors and whether a response is necessary. In today's systems, message time is surprisingly independent of these factors, ranging from 3- to 6 msec in each processor (if two are involved) depending upon the situation. We will use 5 msec as a conservative average: $t_m = 5$ msec.

When a process is switched, this involves first scheduling it (adding it to the ready list), then later descheduling the old process (removing it from the ready list and maybe adding it to the timer list), removing the new process from the ready list, mapping in its code and data areas and passing control of the processor to it. We will assume this takes 1 msec: $t_s = 1$ msec.

The processing time of a process really comprises two major parts:

- The actual processing, which is typically a few thousand instruction executions each measured in microseconds. We will use 4 msec for the purpose of our example; this is not atypical.

- Checkpointing. Each checkpoint message is an interprocess message requiring processor time of t_m . Furthermore, systems are usually load shared; for every checkpoint message sent by a primary process in a processor, another backup process in the same processor will receive a checkpoint message. Thus, in general each checkpoint requires $2t_m$ of processor time.

Since we are assuming that message time t_m is 5 msec, then:

$$t_p = 4 + 2nt_m = 4 + 10n \text{ msec}$$

where n is the number of checkpoints required of the process.

Notice that the time required of a process to process a transaction exclusive of checkpointing ($5 + 4 = 10$ msec) is comparable to a checkpoint time ($2t_m = 10$ msec). Let us define a "logical unit function" (luf) as either the processing of an interprocess message or a checkpoint.

We can then rate a system's raw capacity approximately in luf/sec. In our case, a luf requires 10 msec of processor time. Therefore, one process has a capacity of 100 luf/sec (typical in today's art), and a six-processor system has a capacity of 600 luf/sec.

In summary, then, typical processing values to be used in our example:

- Message time = $t_m = 5$ msec.
- Switching time = $t_s = 1$ msec.
- Processing time = $t_p = 4 + 10n$ msec, where n is the number of checkpoints.

If a message is sent from a process in one processor to a process in another processor, t_m must be applied to each process; if they are in the same processor, it is counted only once (t_m is mainly operating system time required to set up the message paths, rather than the actual byte transfers for moderate-size messages). Responding to a message does not increase the message time significantly, since the paths remain established.

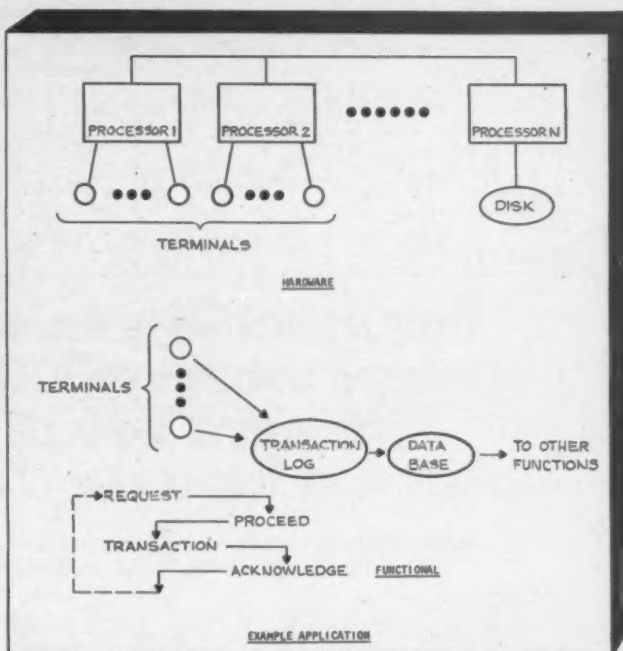


Figure 5-3

These are not unreasonable numbers to use in practice in today's art if better values are not available.

Throughput Example

The example we will use is aimed at analyzing processor load, since considerations of disk, communications and other loads are common in all applications regardless of the type of operating system. Therefore, our example application is heavily processor-oriented, with minimal file access. Nevertheless, it is a very real application.

The application is shown in Figure 5-3 (hardware duality is ignored), and is basically an input spooling applica-

tion. Several terminals are generating transactions to be used to update a data base on disk, which is used by other processing and inquiry programs. A short lag (several seconds to a minute or two) is tolerable in terms of updating the data base, but the response to a terminal must be fast (a few seconds). Therefore, incoming transactions are received, edited and stored on an intermediate disk-resident transaction log at a high priority. Lower priority processes then continuously process the transaction log and update the data base. Since the reception and logging processes are running at a higher priority than other

(Continued on In Depth/4)

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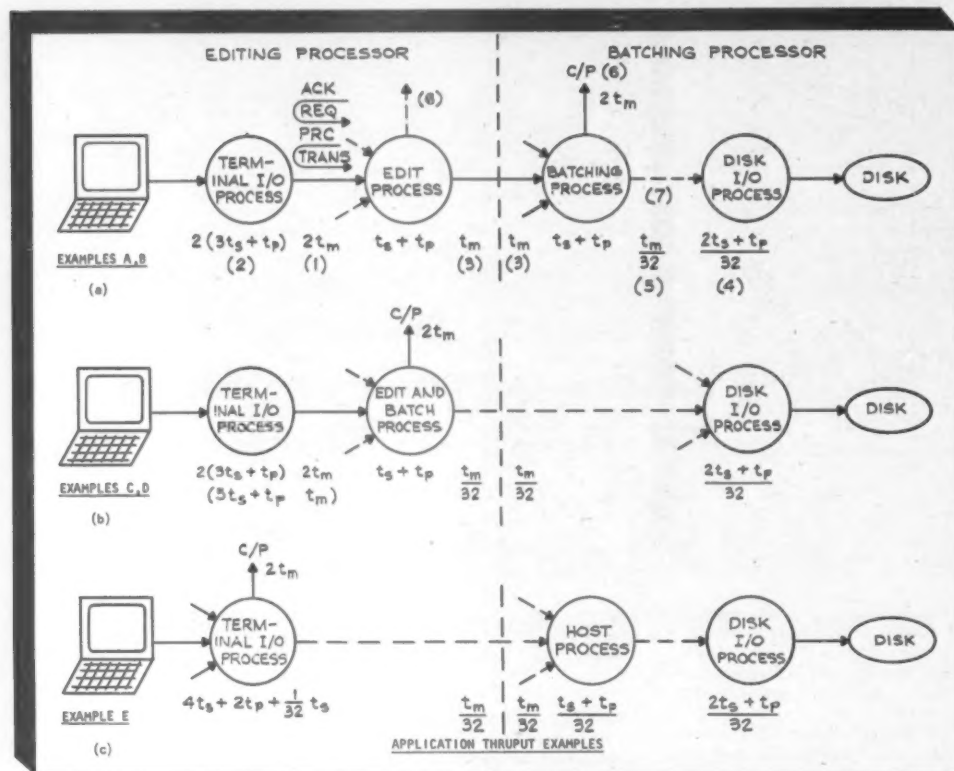


Figure 5-4

(Continued from In Depth/3) processes, other processes are transparent to them.

A terminal buffers a transaction, and when a transaction is ready, it sends a request code to the system. The system

responds with a proceed code, and the terminal then sends the transaction. A transaction from a terminal is completely editable from its own content (no disk files need be accessed). After successful editing and disposition of the

message, an acknowledgement is returned to the terminal, which may then send the next transaction. Procedures for operator and communication errors are not considered so far as throughput is concerned, since errors

are assumed to be infrequent.

This example is a simplified representation of many real applications, including message switching, point-of-sale recording, wire service processing, editorial systems and quotation systems. (Many of these service free-wheeling inputs; we are assuming a protocol to illustrate a point in the example.)

Let us now establish some system parameters:

- Number of terminals: 200.
- Line speed: 30 byte/sec.
- Transaction length: 64 bytes.
- Peak terminal transaction rate: 12/min.
- Maximum average response time: 4 sec.
- Transaction log file block length: 2,048 bytes (32 transactions).

We will further assume that the transaction from the terminal, once received, can be requested again in the event of a switchover and that duplicate transactions in the transaction log file are allowable.

Example A: Single-User, Separated Functions

Figure 5-4a shows perhaps the simplest implementation of this application. Two processes are written: an editing process and a batching process. The editing process supports one terminal. It receives the transaction, edits it and sends it on to the batching process. The batching process receives single transactions from all editing processes and buffers them. When it has batched 32 transactions, it writes them to disk.

The times involved in each step of processing are shown in Figure 5-4a. Some points must be noted; they are referenced to Figure 5-4a via numbers:

(1) Two interprocess messages must be sent from the editing process to the terminal I/O process for each transaction. One is a writeread returning the acknowledgement to the last transaction and setting up a read for the next request. The second is a writeread returning the proceed and setting up a read for the transaction.

(2) Each writeread message to the terminal I/O process requires three process switches: receiving the writeread and initiating the transmission to the terminal; completing the transmission to the terminal and initiating the read; and completing the read and responding to the writeread message.

(3) It is assumed that, in the absence of a processor failure, editing processes run in the same processor as their primary terminal process, and the batching process runs in the same process as the primary disk process. Therefore, a message time must be imposed on each processor.

(4) The disk I/O process requires two process switches for a write message: receiving the write message and initiating the write; and completion of the write and responding to the write message.

(5) Writes to the disk are required only for each 32 transactions.

(6) The editing process does not



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IN DEPTH

have to checkpoint since if it fails, it can rerequest the transaction from the terminal. However, the batching process must checkpoint each incoming transaction. Otherwise, all currently buffered transactions would be lost if the buffering process had to switch over.

(7) The disk is lightly loaded (40 transaction/sec, 32 transaction/block, yields 1.25 access/sec. We assume the batching process is double buffered so that disk writes cause no delays.

We cannot simply add up the times in Figure 5-4a since they range over two processors. Moreover, there may be queuing delays in the batching process, since it is serving multiple users. Let us look at that first.

The service time of the batching processor (from Figure 5-4a) is 20.4 msec. Its maximum transaction rate is 200 terminal \times 12 transaction/min, or 2,400 transaction/min (40 transaction/sec). Thus, from equation (9), the response time R_b of the batching process is:

$$R_b = \frac{1}{1 - 40(.0204)} \quad (.0204) = 111 \text{ msec}$$

This is more than five service times. Therefore, queuing is significant and must be considered. As a function of load,

$$R_b = \frac{.0204}{1 - .0204L} \quad (10)$$

Using this as the average service time for the batching process, the terminal service time R_t is found by adding to R_b the service time R_e of the editing processor, which is, from Figure 5-4a, 34 msec. The editing process does not wait for the batching process; rather, it is suspended and other editing processes may run. Therefore, the editing process time simply adds to the batching time (that is, the batching time does not represent a load on the editing processor):

$$R_t = R_b + R_e = \frac{.034}{1 - .034L/n} + \frac{.0204}{1 - .0204L} \quad (11)$$

where n is the number of editing processors (each editing processor handles only $1/n$ of the load).

Since we must be able to handle the full load, let us look at R_t under full load conditions ($L = 40$ transaction/sec):

$$R_t = \frac{.034}{1 - 1.36/n} + .111 \quad (12)$$

We want to meet two conditions:

- Average occupancy of a processor should be less than 6%.
- Average response time should be less than 4 sec (the communications line takes about 2.2 sec, leaving 1.8 for R_t).

The occupancy is $1.36/n$. $1.36/n$ is less than 0.6 and n is greater than 2.26.

Therefore, three editing processors are needed to achieve 60% loading during peak times. This leads to a response time of .17 sec (2.4 sec total with communications), which is satisfactory.

The raw capacity of an editing processor is $1/.034 = 29.4$ transaction/sec. At 60% load, it can handle about 18 transaction/sec.

With the batching processor, four processors are needed to satisfy the ap-

plication.

Example B: Multiuser, Separated Functions

It is informative to see what would happen if the edit process were written to handle several terminals — let us assume all of the terminals normally handled by one processor. In this case (unless the process were very complex), the edit process will wait for the batching process to respond before processing the next transaction (other

processes could run during this time, but the editing process could not).

The processors cannot be viewed independently in this case. Rather, the service time is the editing processor service time plus the batching processor response time, and is $(.034 + R_b)$ msec. Thus,

$$R_t = \frac{.034 + R_b}{1 - (.034 + R_b)L/n} \quad (13)$$

where R_b is given by equation (10). At full load of 40 transaction/sec

($R_b = .111$ msec), this becomes:

$$R_t = \frac{.145}{1 - 5.8/n}$$

The occupancy of the editing process (not processor, in this case) is $5.8/n$, and should be less than 60%: $5.8/n$ is less than .60. Thus, n is greater than 9.6, and 10 editing processors would be required (11 with the batching processor). Average response time is .35 sec — or 2.6 sec with communications.

(Continued on In Depth/8)

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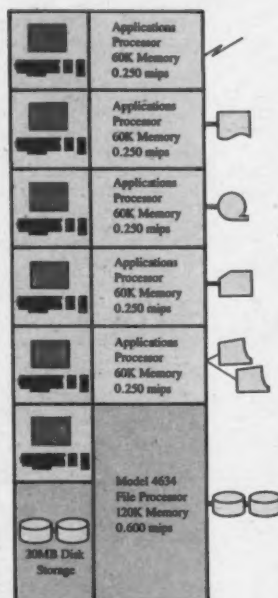
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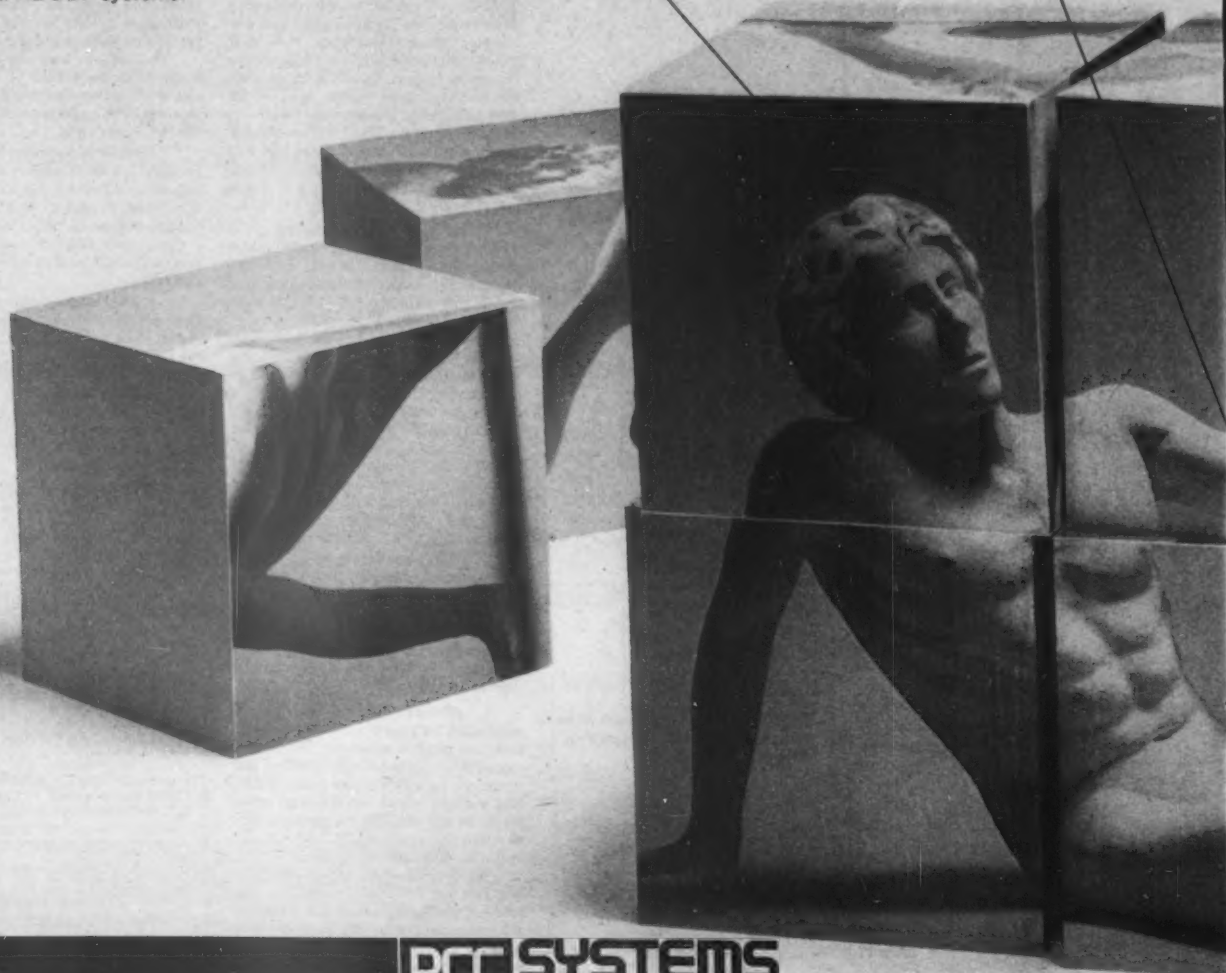
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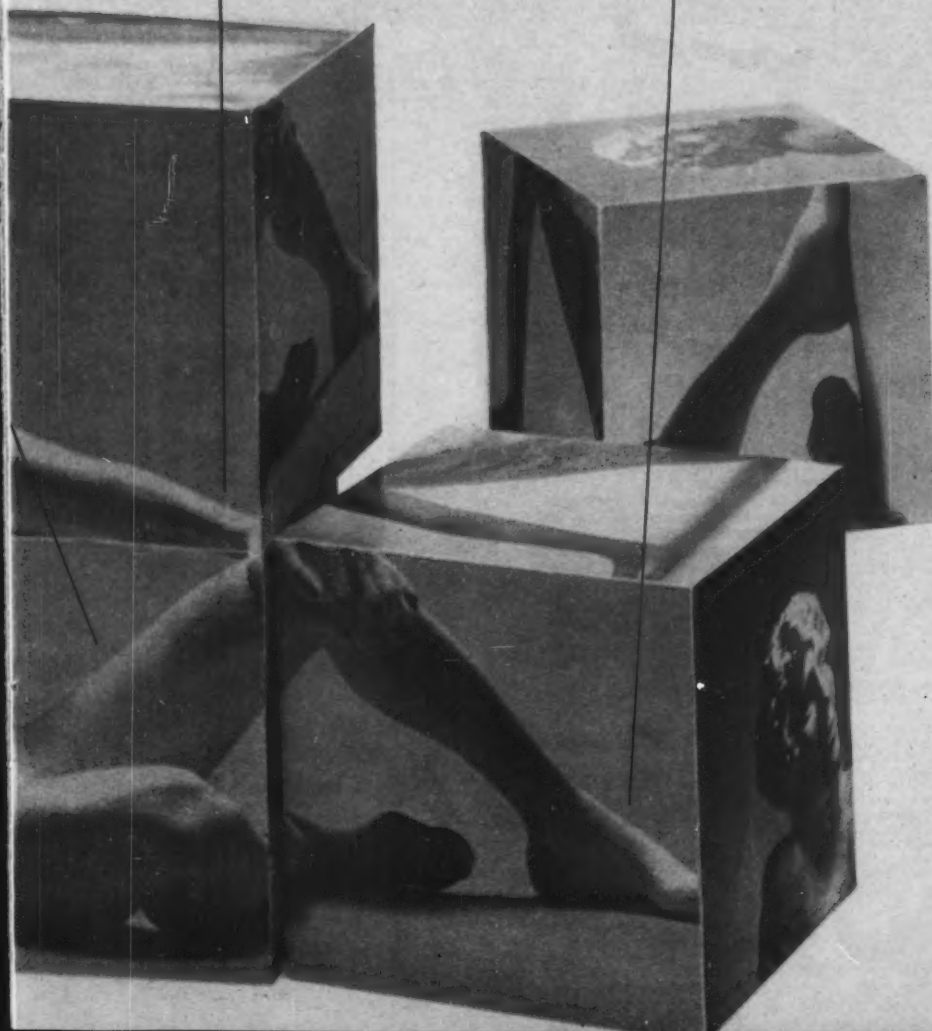
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SURVIVABLE SYSTEMS

IN DEPTH

In Depth/8

(Continued from In Depth/5)

In this case, the raw capacity of an editing processor, at a system load of 40 transaction/sec, is $1/.145 = 6.9$ transaction/sec. At 60% load, it can handle about 4 transaction/sec.

This illustrates the effect of nested queues. They should be avoided wherever possible.

The system of Example A has a bottleneck — the batching process. At 40 transaction/sec and a service time of 20.4 msec, its average load is 82%. This

is dangerously high and allows for no later expansion.

This situation can be cured by running multiple batching processes or by simply letting the editing process also batch, as shown in Figure 5-4b. This moves a checkpoint to the editing processor, but eliminates some interprocess message time and probably requires no more software effort (possibly less).

From Figure 5-4b, the transaction service time is 39.2 msec. As in note (7)

above, we assume that we are double buffered, so that disk writes are transparent. In this case:

$$R_1 = \frac{.0392}{1 - .0392/n}$$

At 40 transaction/sec, the occupancy, which must be less than 60%, is:

$$\frac{1.568/n}{2.6}$$

Therefore, three editing processors are needed. Each has a raw capacity of

$1/.0392 = 25.5$ transaction/sec. However, the disk processing load is so small that it could be connected to the editing processor; thus, three processors are sufficient for the application.

At 60% load, an editing processor can handle 15 transaction/sec. Average response time is 80 msec (2.3 msec with communications).

Example D: Multiuser, Combined Functions

The system of Example C has two problems:

- It may take a long time for one terminal to fill a buffer, which will delay transactions getting to the log file (this can be alleviated by timing out and writing a partially filled buffer if required).
- Page faulting. Each processor will be servicing 67 terminals (one-third of the load) and will be backing up 67 terminals. Each terminal requires 4K of buffering (two 2K swinging buffers). The backup processes must be considered, since each transaction must be written into its backup buffer via a checkpoint message. Therefore, there is a total of $2 \times 67 \times 4K = 536K$ bytes of buffering being managed by a processor.

We probably do not want to buy enough memory to fix these buffers in physical memory. Therefore, under uniform loads from all terminals, we may find a page fault for each transaction, since all other terminals will send a transaction between transactions of any given terminal and must have access to their buffers. Each page fault requires two disk accesses — a write of a dirty page and a read of the new page — since it is likely that it is terminal buffer being overlaid. At 40 transaction/sec, this represents a system disk

Small Business Systems Surveyed Microdata Reality Gets Top User Rating

Microdata Corp.'s Reality, Basic/Four Corp.'s Model 400 and the IBM System/3 models 6, 10 and 15 reaped the highest marks in Management Information Corp.'s (MIC) fourth annual small business systems survey.

To assess how well small business systems are meeting users' needs, MIC polled 568 companies that use 689 small business CPUs.

Each respondent was asked to subjectively rate the vendors and their products on performance specifications have been realized), reliability (uptime vs. downtime), ease of use (amount of time necessary to train new personnel), service (maintenance) and vendor support (such as advance training and program assistance).

A four-point rating scheme was used (1 = poor, 2 = fair, 3 = good, 4 = excellent). The survey results were given as averages of the ratings assigned to each product in each of the five categories.

The Microdata Reality, Basic/Four 400 and System/3 Model 10 and Model 15 were the only small business systems to receive ratings of 3.0 or higher in all five categories.

Taking the average of all five categories, the Microdata Reality topped the field with

a score of 3.66 (based on 27 respondents using 55 units). The Reality earned 3.8 in performance, 3.8 in reliability, 4.0 in ease of use, 3.4 in service and 3.3 in support.

Based on nine respondents with nine units, the average for the IBM System/3 Model 15 was 3.6. This system was rated 3.6, 3.8, 3.6, 3.7 and 3.3 in performance, reliability, ease of use, service and support, respectively.

Eight users with 17 Basic/Four 400's gave that system an overall rating of 3.5. In performance, reliability, ease of use, service and support, the system was rated 3.5, 3.4, 3.8, 3.4 and 3.4.

Following this order, the IBM System/3 Model 10 was

rated 3.3, 3.5, 3.3, 3.3, and 3.3, respectively, by 34 users with 45 units. The System/3 Model 6 received 3.4, 3.7, 3.7 and 3.1 ratings in performance, reliability, service and support, respectively, by eight users with eight units.

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load of 80 access/sec! The system stalls, because realistically we can only expect 20- to 40 access/sec, thus limiting us to a system load of 10- to 20 transaction/sec.

Both problems (page faulting, especially) can be cured by going to an application process that handles several terminals. Let us assume a process handles 32 terminals. For these terminals, only one pair of swinging 2K buffers is required (4K total). If a processor is to handle 67 terminals, three processes are required, with three backups running. This results in $6 \times 4K = 24K$ bytes of buffering (as opposed to 536K), which can easily be fixed in memory.

Timing for this is also shown in Figure 5-4b and is substantially the same as Example C. (Some application process switching time will be saved, since there is some probability that when a transaction is completed, another is waiting and can be immediately serviced. This is small and is ignored.)

Example E: Multiuser, I/O Process Implementation

The multiterminal process of Example D could actually be done totally in the terminal I/O process if desired, providing a host process is provided to send a read message to the terminal I/O process, as shown in Figure 5-4c. This is necessary because the terminal I/O process is not allowed to originate a message to the disk I/O process. The purpose of the host, in effect, is to poll the I/O terminal processes for data and write that data to disk.

Doing this saves a pair of interprocess messages from the application process. Since it is batching transactions, the terminal I/O process must checkpoint each of these to its backup. We assume that its processing time is $2t_p - 1$ for its normal terminal handling, and 1 for the editing and batching functions. Four switching times are required:

- Receive request and send proceed.
- Upon completion of proceed, set up to read transaction.
- Upon receipt of transaction, edit and buffer it and send acknowledge.
- Upon completion of acknowledge, set up to read next request.

For every 32 transactions, an additional process switch is needed to receive the next read interprocess message.

From Figure 5-4c, we see that the transaction time is 22.2 msec. The load is then:

$$.0222 \times 40/n = .888/n < 0.15$$

Thus two editing processors are required. The host load is so small that it could reside in one of the editing processors, so that two processors satisfy the application. Raw capacity of a processor is $1/.0222 = 45$ transaction/sec. At 60% load, a processor could handle 27 transaction/sec. Average response time is 40 msec (2.3 msec with communications).

Example Summary

These examples are summarized in

Example	System Architecture	Raw Capacity (trans/sec) per processor	No. of Processors	Processor Response Time (msec)	Software cost* (man-months)	Problems
A	Single user Separated Functions	29	4	170	0	Heavily loaded batch process
B	Multi-user Separated Functions	7	11	350	4	Nested queues
C	Single user Combined Functions	25	3	80	0	Page faulting
D	Multi-user Combined Functions	25	3	80	4	
E	Multi-user I/O Process Implementation	45	2	40	12	High Software Cost, System-Level Buffers

* Typical

EXAMPLE SUMMARY

Figure 5-5

Figure 5-5. One can conclude that the solutions represented by Examples B and C are not valid. B is far too inefficient, and the possibility of system stalls because of page faulting invalidates C.

A is a possibility if the transaction load will not grow. This is probably a bad bet, and A should not be considered. Besides, the savings of a processor probably justifies D. E should be considered warily. The software costs

are more unpredictable because system level programming is being done (a new terminal I/O process), and the batch buffers might have to come from valuable system data space. However, another processor can be saved.

Other Notes

As an aside, consider the common case in which a backup process that has taken over does not create another backup, by design. Should a processor

fail, the simplex backup process takes over and does not have to checkpoint — it has no backup. It is imposing less load on the system than its primary process since there is no checkpoint load. One can construct cases in which the system will actually speed up by turning off a processor.

With respect to page faulting, the proper organization of a program can reduce this load. Code should be or-
(Continued on In Depth/10)



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IN DEPTH

(Continued from In Depth/9)

ganized so that when a page of code is paged in, it likely contains code all of which is to be executed. A big step in this direction can be taken by simply organizing the program into main line, error processing and initialization areas, rather than having diverse procedures liberally interlaced.

Summary

The penalty we pay for the power of the operating system we have

described is capacity. However, through an understanding of these systems at the level presented — and care in the design of the system — one can achieve quite satisfactory throughputs.

As the examples given here have shown, complex applications or sloppy design can result in processor throughputs of 5 transaction/sec or less. Care in the design of the application can achieve transaction rates of 50 transaction/sec or more — an order of

magnitude difference!

Batching transactions and avoiding nested queues are primary considerations where possible. The minimizing of interprocess messages is also very important.

In any event, these systems provide us with two powerful capabilities:

- Flesh vs. iron trade-offs. Hardware can often be traded for software. As software costs escalate and hardware costs fall, this becomes more and more important.

- Forgiveness. Even if we have mis-designed or underestimated the system load, we are not locked in. System capacity can be easily expanded with virtually no additional software effort by simply adding processors.

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Dr. Wilbur H. Highleyman is president of Sombers Associates, Inc., Mountain Lakes, N.J., a firm specializing in minicomputer and microprocessor turnkey software. He is also chairman of MiniData Services, Inc., a service company.

Previously, Highleyman was responsible for Data Phone development at Bell Telephone Laboratories and was a cofounder of Data Trends, Inc. He has been instrumental in the design and implementation of survivable systems for the graphic arts, communications, financial and wagering industries.

Highleyman holds a B.E.E. degree from Rensselaer Polytechnic Institute, an S.M.E.E. degree from Massachusetts Polytechnic Institute and a D.E.E. degree from the Polytechnic Institute of Brooklyn. He holds four patents and has published extensively on pattern recognition, communications and business minicomputers.

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A better way to select a DBMS

REQUIREMENTS COSTING

"The ideal evaluation strategy is intense long-term usage. This, however, seldom comes before purchase, and afterwards it is not too politic to then determine you have the wrong system."

So wrote Michael M. Gorman in his "Short Paper on the Evaluation of Data Base Management Systems" (Computer Sciences Corp., July 20, 1977).

The literature appears to indicate that most DBMS evaluations are made using a weighted-scoring technique. However, the approach has several problems. How do you distribute and award points? The background of the evaluator often influences the relative weights of factors under consideration. In addition, if cost has a weight of less than 50%, then the highest priced system will probably win since it should provide the best features.

To avoid these problems, I will adapt a hardware selection methodology advocated by Edward O. Joslin (*Computer Selection*, Technology Press, 1977) to the selection of a DBMS.

Requirements costing has three major advantages. First, there is a common denominator used to characterize each system requirement, cost. Everyone associated with the acquisition can understand cost. In addition, the derivation of the cost can be described and defended more easily than an arbitrary weight. Second, the methodology allows you to differentiate between those system requirements that are critical and those that are important, but not vital. Finally, it allows you to determine which system is the best over the entire system life.

Requirements costing involves the following steps:

1. Conduct a DBMS needs analysis.
2. Translate the needs into system requirements.
3. Categorize each requirement as either mandatory or desirable.
4. Issue a request for information (RFI).
5. Adjust requirements, if necessary.
6. Issue a request for proposal (RFP).
7. Validate proposals.
8. Evaluate the remaining proposals.

Step 1: Needs Analysis

The need for a DBMS usually transcends the requirements of an individual application or system. If this is not realized in advance, it is usually discovered by the time the need for a second system arises. Consequently, the scope of the needs analysis should be broad. In addition, the primary reasons for acquisition should reflect the current organizational problems associated with not having a DBMS.

Following are some typical problems:

- Information is not timely.
- Redundantly maintained data results in different answers to the same question.
- System changes are difficult to implement.
- Data in separate systems cannot be used together.
- Information retrieval requires the services of a trained programmer.
- Control of the data resource is difficult to maintain.

Once the nature and scope of the problems to be solved have been determined, a solution must be devised. Assuming that the use of a DBMS is part of the solution, a data base needs analysis must be performed. The study should be performed by a team of analysts with an individual, such as a data administrator, coordinating the process. Through a series of interviews with users of the new systems, the team will derive three things:

- A data base model that reflects the organization.
- A data dictionary.
- The data access requirements.

However, competing vendors will not be making proposals based on your needs. They will be attempting to meet the requirements specified in your RFP. Therefore, your needs must be accurately translated into a corresponding set of DBMS requirements. This is done in the next step.

Step 2: System Requirements

When translating needs into system requirements, it is to the user's advantage to state the requirements in specific terms and in his own language. This should be done prior to talking with vendor representatives. Vendors often try to be the first to visit a user so they can teach the user this terminology. This often results in a significant advantage to the first vendor since competitors are often required to present their system using that terminology.

Many DBMS characteristics will be necessary to support the data base you have envisioned.

Data structure and access. The logical model of the data base developed in your needs analysis will reflect a particular structure that is most suitable to your application. The structure may be hierarchical, a network or a combination, or it may be unstructured, such as a relational data base model. The DBMS must support your data structure. Given the optimum logical structure, what physical storage considerations would be valuable? The data ac-

cess needs will translate into requirements for multiple keys, inverted lists and so forth.

Data base maintenance. Several types of maintenance activities will have to be performed against the data base. If

(Continued on In Depth/12)

What Is Requirements Costing?

Most methodologies for selecting a data base management system (DBMS) are based on a weighted-scoring technique which, many users find, has disadvantages.

An alternative methodology is requirements costing. Under this system, the cost of the DBMS includes the vendor price plus the cost to purchase or develop features the vendor does not provide. In addition, requirements are categorized as mandatory or desirable.

To be eligible for selection, a vendor must provide all the mandatory items. For each desirable item the vendor does not provide, a dollar value is added to the bid to reflect the cost of going without the item or of acquiring it by some other means. The DBMS with the lowest adjusted cost wins.

While requirements costing is not meant to replace weighted-scoring techniques, it does offer an alternative method of evaluation.

Requirements costing is not for everyone. For the organization without the time, personnel or inclination to perform such a cost analysis, the weighted-scoring technique may be the methodology of choice.

Part 1 of this article describes the requirements costing methodology and outlines the entire selection process. If requirements costing does not seem right for your organization, Part 2 gives some advice on how to develop a rational set of evaluation criteria for weighted scoring.

By Michael L. Rice

IN DEPTH

(Continued from In Depth/11)
you foresee the need to perform some of these types of activities, you will want to list utilities to perform them as system requirements. For example, an initial data base loading utility could save a considerable amount of resources that would be required to develop conversion programs. In addition, what editing and validation should the utility perform against the data being loaded?

Since data element independence is an important feature of many DBMS the addition and deletion of data elements only affect those programs that use them. However, what facilities does the DBMS provide to allocate additional space on a record for new elements or free space from deleted elements?

Another important consideration is reorganization. It should be a requirement that a DBMS will not stop functioning because of the need for reorganization. However, be sure that simple and efficient reorganization utilities are available if periodic reorganization will aid performance.

Language forms. Your needs analysis should have illustrated whether a generalized report writer, an on-line query/update language, statistical

analysis programs or teleprocessing monitors are required. These are items that can often be as complex and costly as the basic DBMS and are often available through other vendors.

It may be a requirement that the DBMS have a host language interface to any high-level language, such as Cobol, that are used by your programmers.

Security and privacy. What types of data base error recovery do you require? The needs in this area can vary widely depending on the amount of on-line updating that will be performed. In addition, if multiple simultaneous updates against the same data base are anticipated, the DBMS will have to provide adequate safeguards to prevent illegal updates. If the data in the data base is sensitive, it may be necessary for the DBMS to provide passwords and encoding of data. It may be a requirement that the DBMS provide different passwords for different portions of the data base.

Performance. Although this will not be the most critical factor in many DBMS selections, it is important to determine minimum design requirements for efficiency. For example, a minimum requirement should be that the DBMS will perform buffer manage-

ment to avoid unnecessary I/O's. If performance is more critical, it may be a requirement that the teleprocessing monitor operate in a multithread mode or provide some other approach to overlapping message processing.

Vendor support. There are a number of potential requirements in this area. If your staff is not experienced in the use of DBMS, training facilities will be an important requirement. Adequate documentation, which can be thought of as passive support, should be a requirement. Finally, you must be sure there will be adequate support during installation.

Before going further, this is a good opportunity to examine the set of requirements in terms of the initial problems you were attempting to solve. Do the requirements address the problems and the needs, or do they tend to address solely technical data processing issues? Do the requirements stress what is needed or are they overly concerned with the "how"?

Step 3:

Categorize Requirements

It is important to consider only those requirements that will differentiate among the products. It is pointless to specify that a DBMS handle all I/O.

They all do. Mandatory (critical) items must be distinguished from the desirables (noncritical items).

Mandatories. If a vendor cannot supply a mandatory item, that DBMS cannot be considered. However, it is important to limit the number of mandatory items. As the number of mandates increases, the probability that a vendor's DBMS is eligible for consideration decreases. The objective is to get as many reasonable proposals as possible.

In order to qualify as mandatory, an item should be nonchanging, impossible to rank and represent the minimum capability.

There are several other factors that must be taken into account when considering mandates. First, mandates do not have to be provided by the prime vendor. This will often be the case with data communications monitors. Assume Vendor A's DBMS does not have communications capabilities, although this is a mandatory requirement. However, in order to bid, Vendor A will guarantee that Vendor X's monitor will interface with his system and meet your requirements in that area. This is acceptable.

When pricing Vendor A's system, the cost of Vendor X's monitor will be in-

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cluded, even if you think that another vendor's monitor, which is less expensive, will suffice. The only way you can include the lower cost monitor is to ensure that Vendor A guarantees it and will include it in his proposal. In the event that Vendor A wins the bid with the higher priced monitor, there is nothing wrong with accepting the bid, but acquiring the less expensive monitor.

What if the vendor's DBMs surpasses the minimum capabilities of the mandatory requirements? If excess capability is of value, then it should be included as a desirable and should work to the vendor's advantage. If it is not listed as a desirable and these additional features increase the vendor's price, it will work as a disadvantage.

Desirables. These are requirements that are above and beyond mandates. They are rankable. They represent your willingness to consider alternatives or trade-offs. The vendor that is most successful in providing the desirable items will probably win the contract.

Prior to contacting vendors about the proposed system, a value must be established for each desirable. Remember that an advantage to the requirements costing approach is that cost is a

common denominator for all factors under consideration. Basically, the value of a desirable is the amount it would cost you to acquire the item or go without it if the prime vendor cannot provide it. In order to determine this amount, a value template must be constructed for each desirable item.

Let us assume that it is desirable that the vendor provide us with utilities to reorganize the data base. What is the value of this desirable?

First, what are alternatives if the vendor does not supply one? Second, what are the costs of these alternatives? Here are two alternatives and their associated costs:

- Write the utilities in-house.
 - a. Design, program, test, document \$8,000
 - b. Yearly support (times five years) 2,500

\$10,500

- Go without (decreased efficiency): \$2,000 first year, plus 50% increase each of next four years, since the data base disorganization will worsen \$24,000

The value assigned to the desirable is the lowest cost alternative, which in this case is the in-house development. This is the cost that will be assigned to

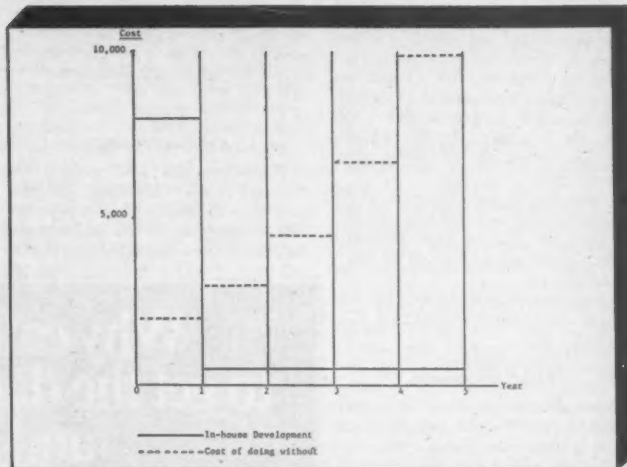


Figure 1. Value Templates for a Reorganization Utility

any vendor who does not provide the desirable item. For the reorganization utility, the value is \$10,500.

The value template is completed by spreading the cost of each alternative over the system's life. This is important for comparing the vendor's bid if certain items cannot be provided until

later in the system life. Figure 1 illustrates the cost over the life of the system.

Step 4: Request for Information

After the system requirements have
(Continued on In Depth/14)

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IN DEPTH

(Continued from In Depth/13)

been categorized and valued, it is useful to let vendors comment on your mandatory and desirable features before a binding arrangement is required. This is done by issuing an RFI. Typically, the purpose of the RFI is to obtain answers to the following questions:

- Does the vendor's system meet the mandatory requirements as presented?
- Does the vendor have legitimate objections to any mandatory or desirable feature?
- Does the vendor feel any features should have been included that were not?

Step 5: Make Adjustments

After discussions with prospective vendors, you should lock them out from further discussion. You now make your final decision on which requirements will be listed and which will be mandatory or desirables.

Step 6: Request for Proposal

Once the requirements have been reviewed and modified, they will be incorporated as a section of the RFP, which will be sent to all prospective vendors. A good RFP should contain at least the following 12 elements, according to Edward O. Joslin:

1. System requirements.
2. Vendor's support.
3. Technical questionnaire.
4. Benchmark data.
5. Bidder's conference data.
6. Check-in dates.
7. Provisions for handling questions.
8. Proposal due dates.
9. Vendor demonstrations and presentations.
10. Contracting conditions.
11. Award dates.
12. General comments.

The system requirements section contains the mandatory and features you have established.

The vendor's support section outlines your requirements for on-site assistance during installation, training for your user and technical personnel and other support requirements, such as assistance in designing the physical structure of the data base.

The technical questionnaire outlines your requirements for documentation of the proposed system's capabilities. They may include requests for vendor literature, independent assessments of the product and current user references.

Requirements for benchmark data are described with the next step. If benchmarks are to be used, the benchmark problems should be described in this section.

Sections 5 through 8 outline the process for vendors to obtain more information about the envisioned system and establish the guidelines for submission of proposals.

The vendor demonstrations and presentations section outlines the requirements for benchmarks or other live presentation.

The remaining sections of the RFP

designate that vendor responses will be included in the contract, indicate when awards will be made and provide a location for other comments unique to this RFP.

Step 7: Validate Proposals

When proposals are received, the first task is to validate them. The purpose of a validation process is to assure that all DBMS in the final phase of the selection process are satisfactory, that

is, they satisfy all the mandatory requirements.

Two types of items are validated: mandatory requirements that represent capabilities and mandatory requirements that relate to performance. In a hardware selection, most of the validation effort is directed towards performance. In a DBMS selection, there may be no mandatory requirements for performance. Notice that desirables are not validated. They are evaluated in the next step.

Capabilities. Vendors will satisfy these requirements by bidding products that are currently available or by bidding products that they claim will be ready by the time you need them. In the first case, the capabilities can be validated by searches of the sales and periodic literature and by talking to current users. Another technique is to try their products on a time-sharing service. This experience will also help you construct benchmarks, if they will be required.

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IN DEPTH

If the capabilities are not yet available, you can either disqualify the vendor or try to validate them by finding out if there is an alpha or beta test site currently using the new product. It is generally wise to avoid being one of the first users of a new DBMS. Remember, "you can tell the pioneers by the arrows in their backs."

Performance. If you are acquiring a DBMS for a single application that represents less than 15% to 20% of your workload, a benchmark to test

performance is probably not cost-effective. However, a DBMS is not just another software package. If the DBMS will be the basis for your entire DP activity, or a significant portion of it, then a benchmark is probably warranted.

Here are a few benchmark guidelines. Do not run a "unit record" benchmark on a DBMS. A DBMS will never handle batch-type reporting as fast as your old sequential file system. Most DBMS run in a multiprogramming en-

vironment. Therefore, the clock time of a run is not meaningful. Use job accounting data to measure its resource consumption of CPU, I/O and memory. Be sure to test the DBMS on a data base of similar complexity and density to your envisioned data base.

Remember, to be valid, a benchmark must test what it is supposed to test. A batch job will not guarantee 3-second response time at a terminal no matter how fast it is run. To be reliable, a benchmark must produce the same re-

sult each time it is run. Clock time will vary from run to run; CPU, I/O and memory should not.

Step 8: Evaluate Proposals

The systems that pass the validation process meet the minimum requirements. The purpose of an evaluation is to select the most satisfactory system from a number of satisfactory systems. Evaluating a system means determining how much it will cost to implement your applications under the system.

The least cost system will win, but this does not mean that the cheapest bid will win, because high alternate costs may be assigned to it for services it does not provide, that is, desirable items.

Using the requirements costing technique, the vendor's price is the cost of each mandatory item, and the lower of the vendor's price or the predetermined value is assigned as the cost of each desirable.

Assume that the reorganization utility for which the value template was derived (see the figure) is desirable. Assume further that Vendor A's proposal states that a utility will be ready by the second year of the system for \$9,000. The cost of in-house development is \$10,500, according to the template.

However, our template also shows a \$2,000 cost for going without the utility for the first year. This brings the vendor cost to \$11,000. Therefore, the vendor is only assigned a cost of \$10,500 for the desirable because it is the lower of the two figures. If Vendor A wins the proposal, we may decide to go ahead and purchase his utility, but for purposes of the evaluation, we assume in-house development.

Continuing in this fashion, a vendor cost is assigned to each desirable item. These costs are summed and added to the total costs of the mandates. The final step in the evaluation is to use systems life costing to determine the true cost over the life of the system.

For each DBMS, determine the actual cost under each method of acquisition such as lease or purchase. In his article, "Purchase or Lease?" (*Journal of Systems Management*, June 1976), Gregory Weidner gave a good explanation of an analytic technique called discounted-after-tax cash flow analysis for determining actual cost. This method takes into account four factors:

- 1) The effect of taxes.
- 2) The amount of cash flow.
- 3) The timing of the cash flows.
- 4) The time value of money.

Once the cost of each procurement alternative is derived in terms of today's dollars, a potential credit needs to be established for any economic value that may remain at the end of the system life, if it is purchased. The way to do this is to determine the probability that the system will be useful for each year after the expected system life. The probability is multiplied by the cost of leasing the system during

(Continued on In Depth/16)

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IN DEPTH

(Continued from In Depth/15)

each additional year. The sum of these products is a credit for the purchase procurement cost.

Each vendor's lowest cost alternative procurement is used to represent that vendor's system cost. The vendor whose system has the lowest cost, after all the evaluations, is declared the winner.

Part 2. Weighted Scoring

The evaluation and selection process for weighted scoring is similar to that for requirements costing. The difference is in the manner in which credit is given for desirable items and in determining how cost will be used as a factor in the selection.

As with the previous technique, the first task is to validate proposals to ensure that they meet the mandatory requirements. Successful proposals must then be evaluated.

A maximum number of points is associated with the evaluation. These points are divided between a cost proposal and a technical proposal. For example, 100 points may be the maximum, with 50 points for cost and 50 points for desirable features. The problem is to allocate this lump sum to individual features for scoring purposes.

Let's assume you are acquiring a DBMS to cut the development time involved in putting up an integrated data base system for the entire set of operational-level applications of the organization. The focus is on reduction in development time and effort rather than on cost or performance.

The features of the DBMS should reflect this emphasis and should be weighted accordingly. In addition, you want to be sure you are not creating a maintenance headache. Consequently, the system must be flexible to meet changing conditions.

Basic Terminology

To acquire such a system, you are going to develop an RFP with mandatory features, desirable features and weighted scores, along with the other components of a good RFP (see Part 1). Since DBMS terminology varies from vendor to vendor, begin by developing your own definitions, such as the following:

- **Data element** — The smallest retrievable unit of data.
- **Group** — A collection of logically related data elements that can be addressed by a single name.
- **Entity** — A logically related set of groups and data elements that are not

defined within groups. Entities are the items that are located/retrieved through the use of keys and indexes.

- **Data set** — The collection of all occurrences of like entities.
- **Data base** — Can be used generically to refer to all the data stored for

use by an organization. Can be used specifically to refer to a group of data sets that are defined for common use by an application.

The features one might look for in a DBMS whose purpose is to cut development time would fall into the fol-

Data Definition Language (DDL)

- DDL defines the content and structure of the data base separately from the application programs.
- Programs make use of the latest (current) data base definition without the need for recompilation.
- If a data element is added to, changed or deleted from the overall data base definition, only those programs using it need to be modified.
- Reorganization of the data base is not required to continue processing.
- If periodic reorganization is required to improve performance, a reorganization utility must be provided.
- Multiple keys are included for the same entity.

Data Access

- Data base is available for concurrent batch and on-line system retrieval, while at least one system is also in update mode.
- Sequential access is included as well as direct access.
- Any single program can access the entire data base.
- Generic searches of entity keys (such as all names beginning with 'SM') can be performed.

Data Manipulation Language (DML)

- Functions that must be supported:
 - a) Direct read using key (data element, group, entity).
 - b) Sequential read (data element, group, entity).
 - c) Add (group, entity).
 - d) Delete (group, entity).
 - e) Change (data element, group, entity).
- Language can handle and allow concurrent updates to the same data set. (That is, it would prevent two or more tasks from updating the same entity, but would allow them to update separate entity occurrences of the same type.)

Host Language Interface

- Ansi Cobol interface.
- Host language can be used in either batch or on-line environment.
- Full range of DML functions supported.

Report Generator

- Accesses the data base through the data management software.
- Generates multiple reports from a single pass of the data base.
- Supports compound selection criteria of multiple conditional statements in conjunction with Boolean operators.
- Has sort capability.
- Supports computation and/or construction of data.
- Provides break logic for report totals and subtotals.
- Able to create output files for use by other programs.

Query Language

- Simple, non-DP-oriented language syntax.
- Accesses data through the data management software.
- Compound selection criteria.
- Computational capabilities.

Security

- Password security is provided, where for each password:
 - Data set-level access can be specified.
 - For each data set, read/write access can be specified.

Backup/Recovery

- Simple, efficient backup procedures capture updates upon run completion.
- Restore facilities quickly reestablish the data base as it was at the completion of the last update.
- Data base updates and their associated transactions are logged.

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Figure 2. Mandatory Requirements

lowing general categories:

- Data definition language.
- Data access.
- Data manipulation language.
- Host language interface.
- Report generator.
- Query language.
- Data base security.
- Data base backup/recovery.
- Training and support.
- Other desirable features.

For each of these areas, a specific set of mandatory and desirable features must be assembled. The rules for differentiating between mandatory and desirable items are the same as they were for requirements costing. Once the mandatory and desirable features have been listed, weights must be established to reflect the potential impact on development time.

First, group features according to the similarity of their development time savings potential. Second, estimate the relative difference in savings between groups. For example, the savings potential of one group of features may be several times that of another group. Finally, allocate points equally to all features within a group.

This is not the only way to develop weights. However, it minimizes the probability that weights will be overly influenced by the background of the evaluator.

Figure 2 lists a sample set of mandatory features. Figure 3 provides the desirable features and their associated weights. Notice that the estimated savings potential of the "large" group is substantially more than the other groups.

The development of an appropriate set of features, such as those in figures 2 and 3, is not a simple task. Likewise, the validity of the weights will depend on the validity of the reasons for acquiring the DBMS. This implies that a substantial effort is required to analyze the organization's true needs.

Regardless of the technique used, requirements costing or weighted scoring, there has been an underlying assumption throughout this discussion. The assumption is that your organization is ready for the development of an integrated data base. Issues such as control of the data and responsibility for data base maintenance, once redundancies have been removed, need to be resolved before the development of integrated systems or the acquisition of DBMS software begins.



Michael L. Rice is a senior consultant with Peat, Marwick, Mitchell & Co. in Washington, D.C. He specializes in data base management systems, administrative information systems, and project management.

Previously, Rice was data base administrator at American University in Washington, where he developed the college's integrated data base and administrative information systems.

Rice holds a B.S. from Virginia Polytechnic Institute and State University and an M.S. from American University.

FEATURE	ESTIMATED SAVINGS POTENTIAL (small, medium, large)	WEIGHT
Data Definition Language (DDL)		
1. DDL allows default values.	S	.625
2. DDL supports special formats.	S	.625
3. One physical data base descriptor supports many logical descriptors.	M	1.25
4. Has support for a tape-based data base.	L	3.75
5. DDL or Data Dictionary/Directory (DD/D) supports edit criteria.	M	1.25
Data Access		
6. Combinatorial key access.	S	.625
7. Qualified, nonkey searches.	S	.625
8. Ability to process indexes only.	M	1.25
Data Manipulation Language (DML)		
9. Direct read — record address.	S	.625
10. Direct read — logical position.	S	.625
11. Direct read — currency status.	S	.625
12. Read-to-update capability.	M	1.25
Productivity Aids		
13. Cobol code generator.	M	1.25
14. Test/debug facility.	M	1.25
15. Screen generator.	L	3.75
16. On-line program development system.	L	3.75
Report Generator		
17. Library for predefined reports.	S	.625
18. DD/D interface.	S	.625
19. Cross-tabs function.	M	1.25
20. Label function.	M	1.25
21. Basic statistical analysis.	M	1.25
Query Language		
22. Cross-tabs	M	1.25
23. Basic statistical analysis	M	1.25
24. Library for predefined commands.	S	.625
25. DD/D interface.	S	.625
Security		
26. Entity-level security.	M	1.25
27. Variable password scope.	M	1.25
28. Encoding of data.	S	.625
Backup/Recovery		
29. Warm restart capability.	S	.625
30. Backup/recovery utility.	S	.625
Other Desirable Features		
31. High-level language for transaction processing.	L	3.75
32. Load/unload utility.	M	1.25
33. Key maintenance utility.	L	3.75
34. Data maintenance utility.	L	3.75
35. Audit programs.	M	1.25
		50.00

Figure 3. Desirable Features

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Amsterdam 30 June-2 July 1980, reference BFT6



Frederic Lamond worked for five years in market research at The Economist Intelligence Unit before joining the computer industry in 1960 as a Senior Systems Analyst for Univac. Since then, he has been employed as Export Sales Consultant and Technical Support Manager for English Electric Computers, Technical Leasing Systems and Research, and European Editor of the Computer Technology Reports. Since 1975, he has combined his duties to the international computing press with a growing activity. He has recently undertaken an intensive study of the market for a major client.

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WOODRIDGE, Ill. — After cutting its DP teeth by renting time on a large-scale IBM system, a combination service bureau and software vendor here decided to ease corporate growing pains by installing an in-house minicomputer.

"We were losing more and more time traveling for a 10-minute [computer] run than it was really worth," Effective Data Processing, Inc.'s president, Bill Martina, said. "We had to either obtain an in-house system or sell the company."

Effective Data Processing recently acquired a Wang Laboratories, Inc. V5 system with 128K bytes of memory, two 75M-byte disk drives, a 430 line/min printer and a 1,600 bit/in. tape drive. The company also installed four CRT workstations that will eventually be upgraded to handle telecommunications.

Previously, the firm rented time on an off-site IBM 360/40, operating under DOS. Since past work loads were not quite as heavy as they are today, processing was done on an "as-required" basis, Martina explained.

"We'd pack up our boxes, tapes and disk packs and run out in the evening — when we could get time on a second or third shift — do our processing, come back to the company and send out the reports," he stated. "This went on for a year."

Successful Combination

According to Martina, Effective Data Processing conducted an extensive analysis of just what was available in the minicomputer marketplace. What he discovered was that while a great many manufacturers offer effective hardware or functional software, very few of them successfully combine the two into a worthwhile system.

For example, Wang was the only company of those surveyed by Martina that offered 360 Assembler, RPG, Cobol and Basic languages. Also, and probably most importantly, the Wang V5 seemed to be the simplest machine to operate, the firm's president said.

"I've worked on an HP (Hewlett-Packard Co.) 3000 and if you didn't have your set of manuals, which stretched across a five-foot table, you didn't get anywhere." Ease of use is important, he continued, "particularly when you're talking about program conversions and programmer productivity."

In terms of processor speed, Martina claims the V5 system runs like an IBM 370/145. He noted that a 15,000-card Assembler edit program that takes a little more than an hour to run on the rented 360/40 took about 15 minutes to run on the V5.

And Cobol programs that usually took a half hour to compile at the old service bureau are completed on the V5 in around four minutes.

Effective Data Processing's Wang system currently operates about 12 to 14 hours per day, six days each week.

One of the firm's services is computerized maintenance of name-and-address files for associations and magazines. In all, Effective Data Processing has approximately 40 different classifications through which it can

(Continued on Page 72)

DG Unveils Diskette Subsystem

WESTBORO, Mass. — Data General Corp. has introduced a single- and dual-drive 1.2M-byte diskette subsystem and add-on 12.5M-byte and 25M-byte hard disk systems, all of which were designed to operate with the firm's Nova and Eclipse minicomputers.

The disk announcement comes just weeks after DG unveiled its dual-disk subsystems that basically combine the diskette and disk into a single package. [CW, Jan. 28].

The Model 6097 DG/Diskette holds 1.2M bytes of data per drive using dual-sided, double-

density recording technology. The medium for the diskettes has 77 tracks per side with DG's format employing 16 sectors of 512 bytes for each track, a spokeswoman noted. The exact formatted capacity is 1,261,568 bytes per diskette.

Diskette data is transferred at 52,500 byte/sec, and the track-to-track head positioning time is clocked at 25 msec. In addition, up to 16 consecutive track sectors can be transferred on the 6097 using a single I/O command, she said.

The diskette subsystem's controller is a single board that plugs

into one slot of the Nova or Eclipse chassis. And the unit is fully supported by DG's disk operating system, real-time disk-based operating system and Eclipse-oriented advanced operating system.

The diskette chassis houses one or two diskette drives, as well as a power supply and cabling.

The 12.5M-byte and 25M-byte add-on drives are standard Winchester-type units that are controller-compatible with the diskette subsystems. The rigid disk devices can also be fitted into systems using DG's previously announced dual-disk units.

The 6097 diskette subsystems are priced at \$4,200 for a single-drive system; \$5,600 for a dual-drive system, offering more than 2.5M bytes of storage; and \$3,800 for a single-drive add-on diskette. The add-on hard disk drives cost \$5,200 for the 12.5M-byte model and \$7,800 for the 25M-byte version.

DG is located at 15 Turnpike Road, Westboro, Mass. 01581.

Interactive Turnkey Aids Hospital Applications

CARSON, Calif. — Northrop Data Systems, Inc. has unwrapped a turnkey interactive business DP system designed to fit the financial and management needs of small- to medium-sized hospitals.

The Northrop Interactive Hospital System (NIHS) II consists of a processor with 64K bytes of memory, a CRT terminal, a disk drive with 20M bytes of storage, a 150 line/min printer, a 1,600 bit/in. tape drive and a modem to facilitate data communications.

The system can be expanded to a maximum configuration of 512K bytes of memory, 32 CRTs, 500M bytes of disk storage, two 600 line/min printers, the tape drive and 32 terminal printers, a spokesman stated.

Software for the system for the system is structured to run in real-time and includes automatic insurance forms processing as well as billing and accounts receivable packages.

Additional software options include payroll, general ledger, accounts payable, word processing and an English language report writer that allows the user to develop custom programs and reports without the need for a programmer, the spokesman claimed.

Hardware and software maintenance fees are included in the

system's purchase price, as is training for all personnel in the system's operation.

NIHS II costs \$65,000 in its minimum configuration from Northrop at 1160 Sandhill Ave., Carson, Calif. 90746.



High-Flying Mini

A workman is shown adjusting the controls of Trans World Airlines' training flight simulator in Kansas City, Mo. Constructed by CAE Electronics, Ltd. in Montreal, the simulator is controlled by a Digital Equipment Corp. VAX-11/780 supermini using an unmodified VAX/VNS operating system.

The simulator duplicates the flying conditions a pilot might encounter at the controls of a Boeing 727 aircraft. The VAX was used in the simulator's design because of its ability to be programmed in Fortran for specific simulation routines.

Previously, flight simulations were written in assembly language, which was time-consuming and required a great deal of expertise with a specific computer, a CAE spokesman said.

TI Extends Bubble Unit With Module

HOUSTON — Texas Instruments, Inc. has extended its TM990-compatible bubble memory systems by adding a module that offers up to 768K bytes of nonvolatile storage capacity.

The TM990/211 uses TI's recently announced TIB1000 1M-bit bubble memory device and has an on-board controller that acts as an interface to the TM990 computer bus. The module can do single- or multiple-page transfers at a maximum data transfer rate of 85K bit/sec, a spokesman claimed.

The device can be supplied with 1M-, 2M-, 4M- or 6M-bit bubble units to provide 128K, 256K, 512K, or 768K bytes of storage, respectively. The average access time for the module is about 11.2 msec.

Prices for the systems range from \$3,200 for the 128K-byte model to \$15,200 for the 768K-byte unit.

TI is located at 12201 S.W. Freeway, Houston, Texas 77001.

MULTIMEDIA

Mini Eases Service Firm's Growth

(Continued from Page 71)
access information from these files.

"We receive input by mail, our operators key it in and we can prepare specialized reports for clients on counts by Zip, by state, by type of person and expiration date of subscription," Martina pointed out. "Data can be selected from either tape or disk."

Property Management

Although Effective Data Processing has traditionally supplied marketing analysis to builders and developers, a complete property management system is presently being developed by the firm.

The system will reportedly include billing, accounts receivable, general ledger and budget analysis — all aimed at a management level.

In addition, Martina envisions expanding this property management system via telecommunications. Data will be entered through remote workstations and reports will be produced at Effective Data Processing. For larger users, both data entry and retrieval will be at the user's site through a remote workstation and a printer.

Stock Market

But, perhaps the most exciting and ambitious plans for Effective Data Processing lie in the stock market.

"We have a complete back-office accounting system for brokerage houses on the drawing boards," Martina revealed. "It will encompass on-line automatic confirmation statements. Each broker will sign in at a work-station and

have access to the portion of the files relating to his company."

Martina noted that the proposed system would allow brokers to immediately generate a confirmation on their printers — which is the whole point of the trade. All data from the trade is stored in Effective Data Processing's files and later that day the information is batch processed, producing the required reports. Brokers could then use these

timely reports to tell what listings they need for stock analysis, to apply commissions to the general ledger account or apply taxes to the tax account, Martina said.

As advice to other users who might be considering the installation of an in-house mini-computer system, Effective Data Processing's chief executive offered four criteria to examine: ease of operation, programming productivity, reliability and, finally, cost.



EDP, Inc.'s president, Bill Martina, checks output of Wang Laboratories, Inc.'s VS system while operator in background keys in data on one of the firm's four workstations.

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The first smart terminal that's more intelligent than it looks.

Zentec, the leader in custom-designed intelligent CRT terminals, now introduces Zephyr™, their first smart terminal. It's microprocessor-based. Compatible with today's most popular smart terminals, including the Lear Siegler ADM-31™. And provides a full range of intelligent features. Like two 1920 character pages of video display. Full cursor addressability. Full editing. And protected forms mode. All standard, of course.

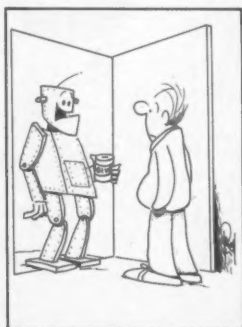
It's a breeze to use, too. The stepped, typewriter-style keyboard offers you all the goodies. Like a full numeric keypad and 16 programmable function keys. All gentle to the touch. And the high resolution, non-glare video display, already easy on the eyes, offers you a full range of video enhancements. Like blinking. Dimming. Underlining. And reverse video. There's even a 25th status line that tells you what's happening, as it's happening. Plus you can transmit data in either character or block mode, maximizing your host processing time.

Best of all, with Zephyr, MTBF is no longer a four letter word. Like every Zentec terminal, each Zephyr is stress tested throughout each phase of the manufacturing process. Then burned in. Tested. And tested again. So that Zephyr offers you the best MTBF rate in the business. That means less dead-on-arrivals. Fewer premature failures. More reliability... from power-up to payout.

Like a closer look? Just write to Paul LaVoie, Vice President of Marketing, Zentec Corporation, 2400 Walsh Avenue, Santa Clara, CA 95050. Or call him at (408) 246-7662. You'll see that for price, performance and delivery Zephyr is really an intelligent buy. But then, what else would you expect from Zentec... the last word in intelligent terminals.

Distributor inquiries are now being invited.

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Controller Ties Printers To LSI-11 or PDP-11/03

HOUSTON — Computer Extension Systems, Inc. (CES) has unveiled a line printer controller that acts as a parallel interface between a printer and the Digital Equipment Corp. LSI-11 or PDP-11/03 processor.

The LPCL11 controller is hardware- and software-compatible with the DEC machines and transparent to the host processors' diagnostics, drivers and operating systems, CES said. The unit has a 10-position switch for address selection and a six-position switch for selecting the vector address.

The LPCL11 costs \$375; OEM discounts are available. CES is at 17511 El Camino Real, Houston, Texas 77058.



The Clerk 300

Business Unit Based on Z80 Has 1M Byte

ATLANTA, — Retail Sciences, Inc. has introduced a microprocessor based small business system that features more than 1M byte of on-line floppy disk storage and includes a variety of business and word processing software.

Built around Zilog, Inc.'s 8-bit Z80 microprocessor, the Clerk 300 has 64K bytes of random-access memory, two serial I/O ports, one parallel port and one of a number of Centronics Data Computer Corp. printers, ranging from dot matrix models with speeds from 60- to 200 char./sec to a 45 char./sec formed character version.

The Clerk 300 also has a CRT terminal and keyboard that boasts regular or reverse video and a 10-key function pad, respectively, a spokesman noted.

The system can use all of the firm's Peachtree/Software products, consisting of a general accounting package with ledger, payroll, accounts receivable and accounts payable programs; an inventory program; word processing; and other business-oriented software routines.

The single-board system retails for about \$12,000 depending on the printer supplied, the spokesman said from Suite 700, 3 Corporate Sq., Atlanta, Ga. 30329.

Inmac Catalog Includes DP Tips

SANTA CLARA, Calif. — International Minicomputer Accessories Corp. (Inmac) is offering a 70-page catalog of computer supplies and equipment that is laced with a number of DP-related hints and operational suggestions.

Some of the "hints" included in the publication cover the effects of fire-extinguishing chemicals on DP equipment and the potential dangers of electrostatic energy in the computer room and protection against it. The catalog also offers tips on how to cut down on potentially destructive temperature and humidity.

The catalog is free from Inmac, Department PR, 2465 Augustine Drive, Santa Clara, Calif. 95051.

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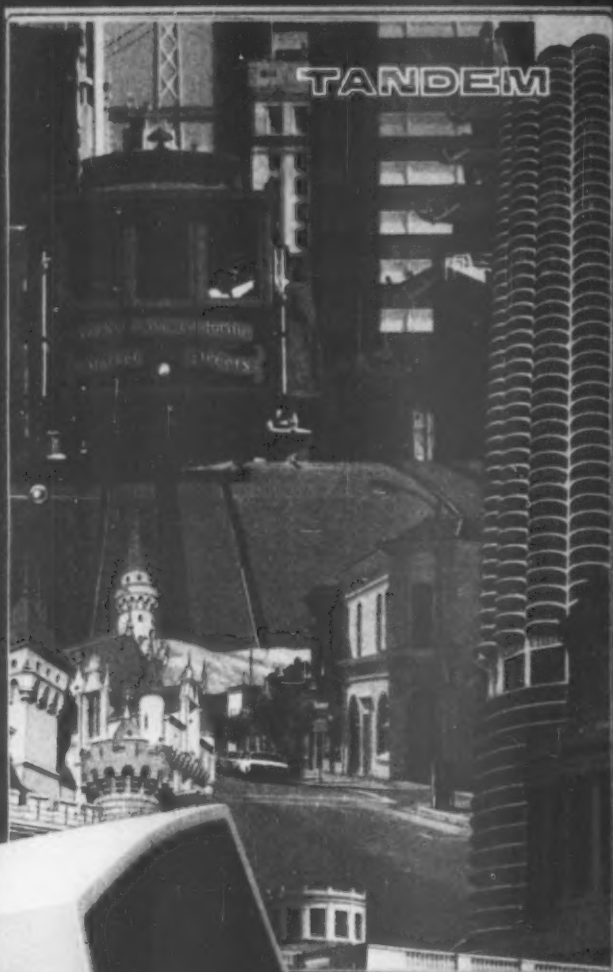
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GUARDIAN/EXPAND

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It began with the Tandem NonStop System. First of its kind. The one multiple processor system in the world capable of continuous operation—even during the failure of a processor I/O channel, disc controller or disc. Without loss or duplication of any transaction, even those in process. And with maximum protection for the data base—at a level unprecedented in the industry. Plus phenomenal flexibility: expandable in low cost increments from a basic two processor system all the way to sixteen processors with the ability to support thousands of terminals per system. File capacity of up to four billion bytes per file, and no limit on the number of files. Extraordinary it is, all by itself, and now as many as 255 Tandem NonStop Systems can be economically interconnected in a powerful, complete and amazingly simplified network. Read on.

Announcing the 4000 processor network.

Here's how to tie together 4000 processors: Easy. Interconnected in the most beautifully simple way. Per the diagram. Point-to-point connections can be made between all centers of overlapping activities, but are not required. We can in fact tie the network together with a single continuous line. And there is no user involvement for pass-through. To get from "A" to "F," no user housekeeping penalties from "B," "C," "D," & "E."



Conventional fixed network is difficult and expensive to expand and modify as needs grow. And they always do. Communication and utilization of data base records from twice removed nodes is prohibitively expensive in applications programming, so more lines are the only viable solution. And that is expensive, too.

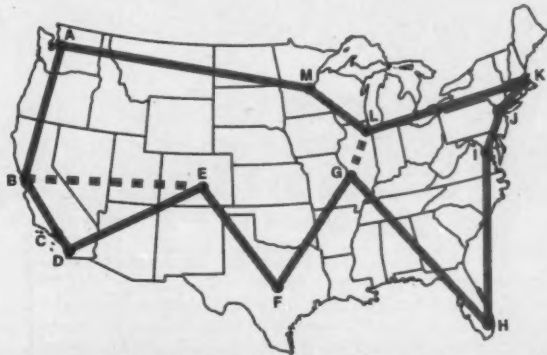
It looks exactly as if all messages were being transmitted only next door. And X25 protocol is available as well.

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Totally transparent. With a split of geography completely invisible to the user. Not the separate interconnected data bases found in other networks but a unified data base completely and transparently accessible throughout the network. No user, and no application program, has or requires any awareness whatsoever as to the actual location of any segment of the data base in the Tandem network. With a Tandem NonStop Computer System, your data may be in Ypsilanti, but it looks for all the world like it's residing right in your own local system.

To get rid of a host of problems, get rid of the host.

Having a host system in a network is traditional. Unfortunately, it is also the traditional point of concentrated difficulties. For when the host goes down, so does the whole network. And even if the host is only suffering an intermittent difficulty, the integrity of the data base is up for grabs, not only in the host, but throughout the remote data bases as well. With Tandem's GUARDIAN/EXPAND Network, a local failure has no impact whatsoever on the rest of the



Tandem pass-through packet switching enables "A" to communicate with "E" at no penalty in system overhead. And you can add direct lines, per "B" to "E" or "L" to "G" whenever traffic warrants without disrupting system performance or efficiency. Note that nodes can be of variable sizes, all using Tandem NonStop Systems as the common element. Efficient, powerful and extremely low cost.

system, and best-route switching automatically circumvents the trouble spot. If there is a failure in the communication link, the system will automatically go around it. The system and the network stay up and running, and best of all—the data is intact, its integrity assured.

A unique and unified operating system—free of geographic limits.

Whereas most network operating systems are created "on top" of prior operating systems, at significant penalty, Tandem's Guardian Operating System was created from day one for the multiple processor environment. It treats *all* resources within the system as files, both hardware and software, and accordingly achieves complete geographic independence, both for the user and for the user's programs. This is beautiful at any time, and it is a lifesaver when increased work loads call for an expanded system, more processors and peripherals, and perhaps a new configuration of resources. This is unique: no reprogramming is required, not even recompilation.

The long and the short of it—keeping costs down and performance up.

No one can do that like Tandem. For the differing needs at each node can be met by the expandable Tandem NonStop System in varying configurations. Single system programming works over the entire network and will continue to work regardless of growth and complexity of the system. And because this is after all a mini-based system, the costs are low to begin with and add-ons come in low-cost increments. Without one cent of penalty on the original investment.

Comprehensive software—transparent and segmented.

Under the overall supervision of GUARDIAN/EXPAND, the Network Operating System, each individual system maintains its own Guardian Operating System plus all of the multiple processor and control communications systems and a host of applications languages including industry standard ANSI '78 FORTRAN and ANSI '74 COBOL. With T/TAL, EDITOR, SORT/MERGE, DEBUG, TGAL, ENFORM Query/Report Writer, and complete remote diagnostic capabilities, the software package of the Tandem NonStop Operating Network is truly impressive. Best of all, it never requires one iota of modification as systems, nodes and the entire network expand and are modified to suit changing requirements. And any Tandem GUARDIAN/EXPAND node can communicate with IBM or any other mainframe using industry standard protocols. We've made it possible and practical to go from any industry standard system to a low cost, comprehensive and flexible network without sacrificing your original installation.

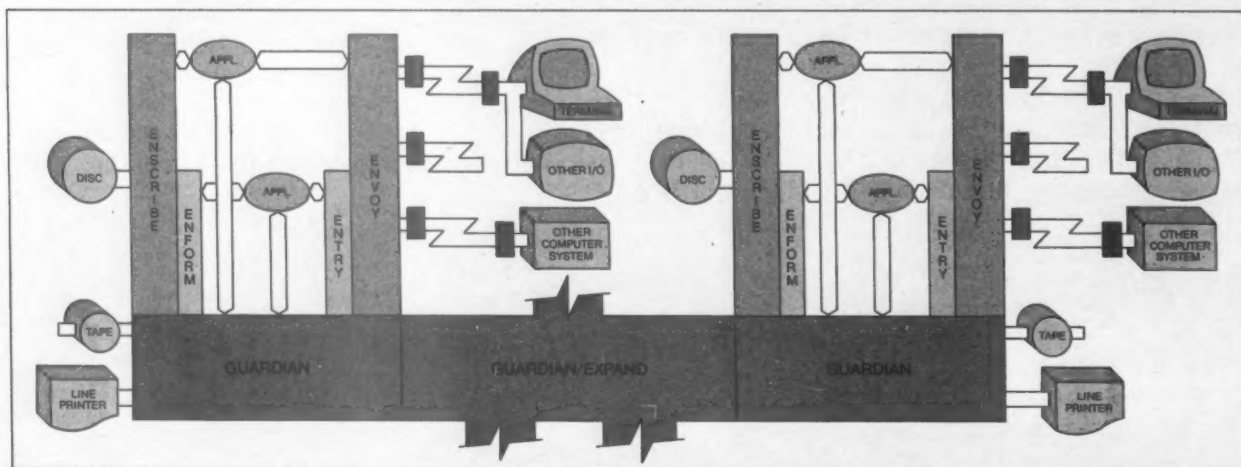
If you're from Missouri, too.

Call or write for complete information about the Tandem NonStop Operating Network. We'll be happy to demonstrate both how and why this system will cost you less to begin with, less to expand, and less to operate than any other network on the market today. And most likely for years to come.

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TANDEM

Firm Retires Typewriters, Triples Its Output

By Kristie B. Kral
Special to CW

ARDSLEY, N.Y. — By virtually eliminating typewriters, a diversified chemical company here has nearly tripled its written output and done away with the need for an army of secretarial people.

Some time ago, Ciba-Geigy Corp., a firm with more than 10,000 employees that deals principally with the development and manufacture of special-purpose chemicals and chemical products, established an in-house word processing (WP) center than can handle up to 450 written jobs weekly. A job could be a letter, memo, long report, statistical text, mailing list or research finding. In short, anything dealing with words is funneled



Ciba-Geigy supervisor instructs operator as part of the on-site training program.

through the WP center.

Typewriters are still used, but only to create mailing labels.

Until mid-1973, all correspondence and reports issued from any of the firm's regional sales offices, distribution centers and warehouses — located in 32 states — were individually typed by a large clerical staff. Then, under the aegis of Joan Busch, manager of administrative services, the WP center was established. The center utilized electronic typing stations that entered information on small magnetic cards for subsequent editing and automatic output. A total of 12 stations was installed. Each typist in the center had her own magnetic card station.

But, Ciba-Geigy's job needs became more complex. For instance, the Plastics and Additives (P&A) Division, which specializes in multimarkets and sells a variety of products ranging from paint pigments to epoxy resins, now deals with complicated proposals, lab reports and other projects. This increase in the work load created a serious overload situation.

In March 1975, after a thorough investigation of viable alternatives, the WP center opted for the Vydec, Inc. CRT text-editing system. Each system, integrated into a single area workstation, consists of a CRT that can handle up to 160 char./line with a memory capacity of 4,093 char., an electronic keyboard, a disk drive with a 60-page-plus-one capacity for additional or temporary storage and a 32 char./sec printer.

One Replaces Two

For every Vydec system installed, the WP center was able to phase out two card stations. Six Vydec systems were installed at this point.

The center also changed its bin setup to a system where jobs are divided by department with a first-in/first-out output basis within each department. Each of the six system operators involved is responsible for one department within the division. This developed unit identification between the correspondence secretaries and authors in each department.

Better throughput resulted, and the WP center raised its production output from 80,000 lines to more than 120,000 lines monthly.

By winter of 1976, two more Vydec systems had been brought in, eliminating the last three card stations. By year end, output had increased from 150 documents to more than 250 documents weekly.

In 1977, one more Vydec unit was added for use as a training module.

During 1977, productivity increased to the point where the WP center handled 400 to 450 jobs emanating from as many as 200 authors.

Once a week — sometimes less frequently — half of the P&A sales force send cassettes through the mail to an administrative secretary in the marketing area. These cassettes contain sales call reports. The secretary merely fills out a work order and sends it, along with the dictation, downstairs for processing.

Other inputs to the center come from division authors on an in-house telephone dictation system, on individual cassettes from personal dictation units or occasionally as handwritten copy.

The editor system produces about 40% more lines per hour than a mag-

netic card station. Even with fewer operators (eight) and one staff assistant, the WP center has obtained greater throughput. To top it all off, costs are less on the current WP installation than on previous equipment with lower productivity.

Training operators to use the CRT text editors is no problem. When hiring, Ciba-Geigy generally looks for mechanical skills like a familiarity with keyboarding and DP devices, as well as excellent grammatical skills. The ability to work under occasional pressure with the rest of the WP team is also stressed.

Karen Philp, the WP staff assistant, trains administrative secretaries and departmental operators on the Vydec

(Continued on Page 78)

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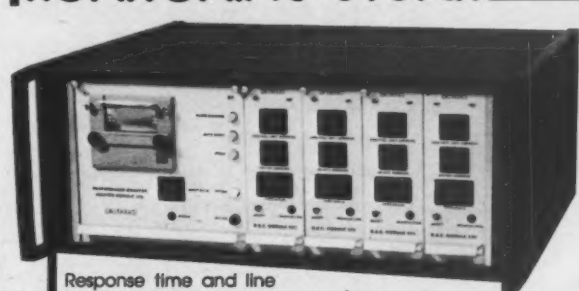
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CRT Controller Displays Graphics in Eight Colors

PHOENIX — A single-card bus-compatible color CRT controller for microcomputer systems that can be used to create graphics displays with eight foreground and background colors has been introduced by Phoenix Digital Corp.

The MCG 6800 is compatible with M6800, 6801E and 6809E microprocessors and provides 128 upper- and lower-case characters over a 24-line screen format.

The device contains independent static random-access memory sections for display memory and graphics memory.

Graphics abilities include storage of array formats, a spokesman said.

The unit utilizes an internal 16-MHz clock for CRT timing and external synchronization requirements. The controller can be configured for modem or standard computer interface with 16 possible selectable data speed rates, he added.

Included is a serial communications port for RS-232 devices. The MCG is supported by a firmware package available on the host microprocessor for full cursor control and screen functions such as underline, inverse video, scrolling and character-line positioning.

Prices for the controller start at \$595, the spokesman stated from 3027 N. 33 Drive, Phoenix, Ariz. 85017.

DG Analog Signal Converter Controls Industrial Processes

WESTBORO, Mass. — Data General Corp. has introduced an analog signal converter for its Nova and Eclipse minicomputers that allows the machines to be used to control laboratory and industrial processes.

The analog data subsystem (ADS) is a 15-in. board that offers 32 single-ended or 16 differential analog inputs, two analog outputs and a Z-pulse for oscilloscope control. Data transfers are made through either programmed I/O or a direct memory access channel.

Software support for the ADS is provided by the Sensor Access Manager (Sam), which runs under DG's real-time disk operating system. Sam reportedly lets sensor I/O operations be

programmed in Fortran IV, Fortran 5 and assembly languages.

ADS costs \$2,000 with quantity discounts available from the company at Rt. 9, Westboro, Mass. 01581.

Choosing, Using Business Minis Topic of Course

MADISON, N.J. — Fairleigh Dickinson University's Florham-Madison campus here will hold a one-day briefing on March 19 dealing with the effective use and selection of minicomputer systems for business applications.

Sponsored by the university's Samuel J. Silberman College of Business Administration, the program will cover the use of minicomputers in small and medium-sized businesses as well as in large corporations. It will also present an organized approach to the understanding, evaluation, selection and installation of small business and minicomputer systems, a spokesman stated.

The session will consist of a series of lectures by professionals who have dealt with minicomputer installation and operations.

The registration fee is \$160, which includes all materials and breakfast and lunch. Additional details can be obtained by calling either the College of Business Administration's program director or technical coordinator at 201-377-4700, or by writing directly to the school in Madison, N.J. 07940.

WP Center Triples Output

(Continued from Page 77)

text editor set aside solely for this purpose. Ciba-Geigy has also contracted with an outside temporary employment agency to have a temporary worker sent each month for 24 to 40 hours of training — spread out over the month — on the editor. A standby pool of trained operators is therefore readily available should a need ever arise.

Hiring and training procedures seem to be successful because turnover of personnel is minimal and usually is caused by personal reasons rather than job-associated problems.

There is a never-ending search to increase the services of the WP center. An increased growth in correspondence is, of course, expected. Currently the center is examining the feasibility of linking the Vydec system with such outlying areas as Michigan, Texas and Rhode Island and to the main computer center for record storage and retrieval. A possibility exists of outputting photocompositor-compatible paper tape to eliminate one step in typographic preparation for Ciba-Geigy's in-house printing facility.

Another possibility is distributed WP, where CRT text editors would be placed in operating divisions and would be on-line to the WP center.

Kral is supervisor of WP services for Ciba-Geigy's Plastics and Additives Division, based in Ardsley, N.Y.



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Emergence as 'Complete Carrier' Changing Course of SBS Orbit Charted

By Jeffrey Beeler

CW West Coast Bureau

PALO ALTO, Calif. — Satellite Business Systems, Inc. (SBS) will undergo an "absolute revolution" during the next five years as the company changes from a simple supplier of wideband digital links to a "complete carrier," offering a broad range of communications services, the head of a consulting firm predicted here recently.

If SBS exploits its chosen markets to the hilt, nothing less than a full-fledged revolution will suffice, according to Yankee Group President Howard Anderson. As part of that revolution SBS may increasingly assert its independence from its financial backers, particularly IBM, he observed.

At present, SBS is still a long way from being able to supply the full package of communications services its customers will demand to solve their future data communications problems, Anderson said at a Yankee Group-sponsored seminar exploring IBM's evolving network strategy.

For long-haul transmission, he explained, SBS seems to have matters reasonably well under control. The company plans to meet its prospective users' major needs through a combination of \$15,000/mo earth stations and communications satellites, the first of which is scheduled for launching on Oct. 23.

Unfortunately for SBS, the most important issue the company will have to confront during the 1980s will be local, not long-dis-

tance communications. And on the local communications front, Anderson said, the firm has shown little inclination to become involved.

Yet become involved it must, because solutions to short-haul transmission problems will be demanded by its users. After all, he said, 85% of all data transmissions are limited to a range of less than 500 miles and 50% to less than 50 miles.

To address its customers' local communications needs, SBS will have to "get its hands dirty" with services it never originally envisioned it would have to provide, Anderson said. Some of these services will include value-added features, intercompany communications, low-cost antennae, terrestrial hookups and private digital microwave. The firm will even have to lay cable in its users' installations.

In short, the company will have to provide much of the same local-transmission "functionality" currently promised by Telenet Communications Corp.'s networking services and by Bell's proposed Advanced Communications System.

(Continued on Page 86)

Data Dimensions Sells Off Lease Base of Dumb Terminals

COS COB, Conn. — Data Dimensions, Inc. has sold its lease base of dumb terminals for \$2.3 million to Computrend, Inc. of Burlington, Mass. The move is in keeping with the company's plan to shift its marketing priorities from dumb terminals to intelligent terminals and small business systems.

The shift was necessitated by supply problems Data Dimensions is having with dumb terminal suppliers, most notably Digital Equipment Corp. Because DEC's VT-100s, LA-136s, LA-120s and LA-34s are all on allocation, last year was a financial disaster, Lester M. Gottlieb, Data Dimensions' president, explained.

In the first nine months of 1979, the firm lost \$1.2 million and will also show a loss for its fourth quarter. By comparison, the company earned \$653,000 in 1978.

"We are backlogged to the hereafter," Gottlieb noted, adding that his company will fulfill contractual obligations to customers but will no longer concentrate on selling dumb terminals.

While Data Dimensions will market dumb terminals for Computrend in certain areas of the U.S., the firm will not be involved in the leasing or servicing of this equipment. Data Dimensions also sold its maintenance business to Computrend for \$140,000.

The firm is now concentrating on selling intelligent terminals and small systems. Last August Data Dimensions took on the marketing of Durango Systems, Inc.'s system and has already developed software for the system, Gottlieb said.

Although the book value of the sale to Computrend is \$2.3 million, Gottlieb estimated that after adjustments his firm will re-

alize about \$3.8 million. Most of the funds derived from the sale will be used to reduce debt to its principal lenders.

Former Intel Execs Establish Own Firm

By Marcia Blumenthal

CW Staff

SUNNYVALE, Calif. — Lazor Systems, Inc., founded recently by seven former executives and engineers from Intel Corp.'s General Systems Division, introduced its first product last week and is planning to unveil two small business systems at the National Computer Conference in May.

The firm introduced add-in memory for Digital Equipment Corp. LSI-11, LSI-11/02, PDP-11/03, and PDP-11/23 systems. Sold through distributors, the 32K-byte boards are priced at \$680 each and will be sold to end users for about \$1,000 each, about \$200 less than DEC's price, according to Lazor's president, Rex Rasmussen.

However, add-in memory is not the firm's primary focus. Because the memory is similar to that being developed for Lazor's own small systems, it presented a good marketing opportunity, Rasmussen noted.

Lazor is developing two small systems, the E and S series. Rasmussen said the play on the IBM E series code name was inadvertent.

The S system will be the more sophisticated of the two models. It will feature up to 1M byte of main memory and 4M bytes of virtual storage, with cartridge disk mass storage up to 96M bytes, Rasmussen said.

The operating system will feature multiple single-board CPUs on a single bus. "It's a functionally organized business system with separate functions on individual boards," he explained.

Although the design is currently widely used for small systems, it is becoming an accepted design technique for these systems, he added.

The S system will be priced in the \$35,000 to \$50,000 range depending on the I/O devices and printers selected. The other system, the E series, will be a flexible disk system priced in the \$23,000 range.

Lazor intends to sell these systems, particularly the S series, through systems houses that can provide entry into specific vertical markets.

The new firm is entirely financed by the seven founders. During Rasmussen's seven years at Intel, he had a broad range of responsibilities including the development of several advanced systems.

The other principles in the firm are David Fuller, vice-president; Harold Henrich, director of engineering; L.B. Davis, manager of software development; Pete Mole, senior programmer/software development; Bill Carter and Ron Truhlar, both staff engineers.

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Ippolito on PCM Market: It's a Roller Coaster

By Ann Dooley
CW Staff

WALTHAM, Mass. — The plug-compatible market is like a roller coaster that is constantly moving, and IBM is at the controls, according to Stephen J. Ippolito, president of IPL Systems, Inc.

Ippolito, who founded IPL Systems in 1973 after working at IBM as a design engineer, recognized the potential of the plug-compatible market when others still believed it would be impossible to compete against the giant mainframe.

Today, the plug-compatible manufacturers' (PCM) market is a small but steady segment of the industry that, according to Ippolito, is "constantly testing IBM's threshold of pain. IBM



CW Photo by A. Dooley

Stephen J. Ippolito

has discovered that to really hurt the plug-compatibles, IBM would have to really hurt itself," he claimed.

Early in its history, IPL Systems experienced a traumatic change. In one day the firm grew from six to 46 employees when its partner, Cambridge Memories, Inc. — for whom Ippolito had worked briefly — found it could not meet manufacturing requirements. The smaller IPL Systems not only continued to design but also to manufacture the systems which Control Data Corp. agreed to market.

A privately owned company, IPL Systems now sports 170 employees, claims an installed base of 130 machines, has introduced a new machine each of the past three years and has realized more than \$12 million in revenues in 1979.

The firm recently announced that it intends to buy out Cambridge Memo-

ries' remaining minority ownership rights, thereby establishing itself as fully independent in the eyes of the industry.

Looking back on his firm's first seven years, Ippolito noted that starting up was even more difficult than he had anticipated. "I thought everything would be faster and easier," he jokingly admitted.

Noting that both IBM and the PCM business are tough competitors, Ippolito said he believes tight financial controls are key ingredients for success. "We spend money only when necessary" and also require highly technical staff to constantly anticipate what IBM will do next, he said.

It is not possible to sit back and wait to see what IBM will do — a company has to act quickly, an advantage for a small, more flexible firm, Ippolito added.

The 4300 Experience

As a professional IBM watcher, the IPL Systems president was surprised at the aggressiveness of the IBM's 4300 pricing. "IBM ended up hurting itself as well as some of the PCMs," he commented.

Previously, IBM believed it could cut prices at both the high and low ends of the market and still make profits, but this time sales were affected up and down the line as users began to rent instead of buy equipment, and IBM's 1979 earnings showed it, Ippolito noted.

The 4300 experience taught IBM to be more careful. It will not change its strategy, he predicted, only the degree. IBM will be less aggressive in pricing when it realizes it has competition wherever it goes — in both hardware and software, he added.

The 4300 introduction also showed the PCMs the limits to which IBM can go by increasing demand while at the same time creating long delivery times, he said. But Ippolito noted that the PCMs learned the industry was not a free ride, and that constant improvement is required to compete against a constantly moving target.

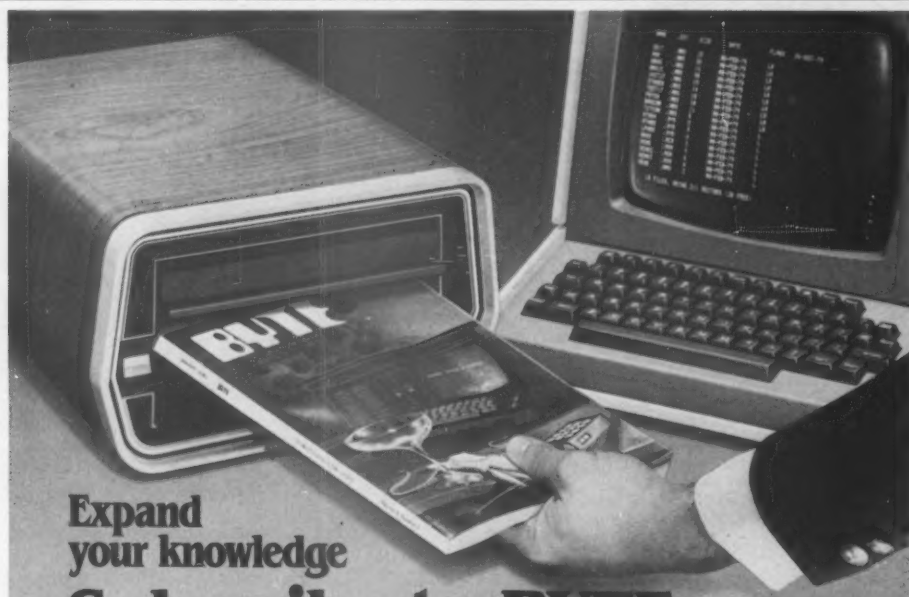
What the Future Holds

For the future, Ippolito has no plans to enter the end-user market. IPL Systems plans instead to achieve market penetration by selling to established companies like CDC and Olivetti Corp., with which it recently announced an agreement [CW, Feb. 4]. "Strong partners lend stability to IPL Systems and help it balance against the IBM ride," he noted.

Ippolito, however, does recognize the advantages of branching into other markets to solidify his company's base and is not ruling out the possibility of eventually introducing a special-purpose computer.

In successfully coping with the IBM 4300 introduction, the PCM industry established itself as a permanent force in the market, according to the IPL Systems president. Although few new entrants will be coming into the market — except for possibly some Japanese firms — people now recognize there is room for IBM and a few strong PCM companies, too, he said.

Ippolito wants to see his company emerge as IBM's major competitor in the small to medium end of the industry.



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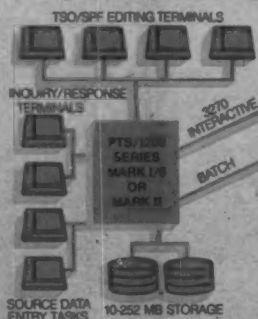
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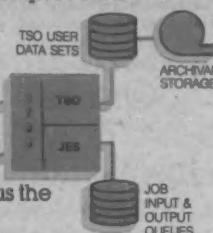
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UN Buying Five HP 3000s For Installation in PRC

PALO ALTO, Calif. — Hewlett-Packard Co. has clinched a \$1.8 million order with the United Nations Development Program for five HP 3000 Series III systems to be installed in the People's Republic of China (PRC).

In addition to the five processors, HP will provide the PRC with 46 terminals, 20 disk drives, seven line printers and 15 hard-copy terminals as well as related software.

Users in China will include several government ministries and a university, HP said.

The systems will be supported by HP's Far East headquarters in Hong Kong for three years. However, 30 tech-

nical people from China will spend four months at HP's training center in Cupertino, Calif., learning to support hardware and software.

The order is subject to export control approval, HP said.

The UN organization that placed the order is helping China establish an information processing and training center to speed that country's modernization effort.

Foreign Orders & Installations

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The order is subject to export control approval, HP said.

The UN organization that placed the order is helping China establish an information processing and training center to speed that country's modernization effort.

Other Orders

LTA Construction Ltd. of Elandsfontein, South Africa, has ordered a Perkin-Elmer 3220 supermini from Protea Computers for installation in the first quarter of 1980.

Honeywell Information Systems, Ltd. has received two orders from British-based com-

IRCs Doing Too Well?

WASHINGTON, D.C. — A three-year audit by the Federal Communications Commission (FCC) of U.S. international record carriers (IRC) has produced some evidence that they are earning excessive profits.

The study suggested that in 1976, ITT Worldcom's return on equity was 17%, RCA Global Communications, Inc.'s return was 10.8% and Western Union International's return was 11.4%. TRT Telecommunications Corp., the smallest IRC, brought in .5% that year.

The FCC report also indicated that some services provided by the IRCs are

improperly cross-subsidizing other services. But because the carriers' records are incomplete, the commission is presently taking no action beyond authorizing the chief of its Common Carrier Bureau to "ensure" that the carriers improve their accounting procedures and comply more fully with FCC requests for financial information.

One reason much remains to be learned in the matter is that the FCC audit staff encountered "many problems with the carriers' personnel concerning the staff's right of access to financial records," the FCC audit report stated.

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Altergo, CPP Sign Pact

BOSTON — Altergo Software, Inc. will market in the U.S. and Canada Computer Program Products' (CPP) Improve range of European-developed software products.

Altergo is the U.S. subsidiary of Altergo Software Ltd. of London and markets its parent company's Shadow II teleprocessing monitor, Space Monitor and Quota II software in the U.S. CPP, the software product arm of the UK's CAP-CPP group, is increasingly intent upon selling its software in the U.S. market, according to Kevin Hughes, CPP European operations director.

Altergo has 460 product installations in North America. Aimed at DOS/VS and VSE users, CPP's Improve consists of Improve/MON, Improve/CICS, Improve/Real-time and Improve/JCL.

Nixdorf Restructures Top Brass

BURLINGTON, Mass. — Nixdorf Computer Corp. has restructured some of its top management positions and named Carl H. Janzen its new president.

Formerly general manager of Digital Equipment Corp.'s general international area, Janzen succeeds Klaus Luft, who will continue as chairman of Nixdorf and vice-chairman of the parent company, Nixdorf Computer AG of West Germany.

Janzen will oversee Nixdorf's operations in the U.S. and Canada.

Executive Corner

In other moves, Nixdorf created three new positions. Allen Burgess was named vice-president of development. He was most recently

director of processor development at Data General Corp.

John H. Kells, formerly vice-president of sales for distributed processing systems, was promoted to fill the new position of senior vice-president of sales.

Michael I. Philpott became the new vice-president and chief operating officer of Nixdorf Personal Computer Systems, Inc., a subsidiary of Nixdorf that manufactures and markets the LK 3000 hand-held personal computer. Nixdorf acquired the rights to the LK 3000 for \$2.5 million from Lexicon Corp. last September [CW, Sept. 24].

Thomas H. Conway, who served as Nixdorf's chief executive officer, has relinquished this position, according to Nixdorf, to "take on responsibilities for a number of new activities and ventures planned for the U.S." He continues to be a member of the board and executive vice-president of the firm.

During 1979, Nixdorf's U.S. revenues topped \$100 million.

Other Moves

- James Charnes has been appointed president of Computer Interface Technology in Santa Ana, Calif.

- George F. Hamner Jr. has been elected vice-president of business and technical planning for the GTE Communications Network Systems Group, a division of General Telephone & Electronics Corp.

- Ray M. Ybaben has joined Computer Sciences Corp. as vice-president of engineering and communications for the Development and Operations Division.

- John Craig has been named publisher of the bimonthly *Infoworld* newspaper, scheduled to make its debut this month.

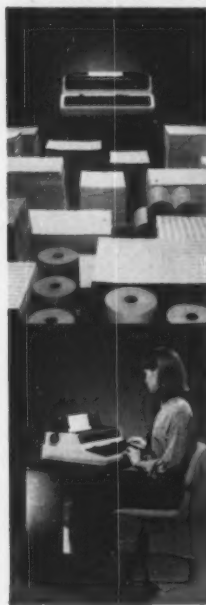
- Ryan P. Schmeltz has been named senior vice-president of Remote Computing Corp. He will manage the Chase Manhattan Bank Project and continue to head all major account marketing activities.

- George W. Muller was appointed senior vice-president of NEC Microcomputers, Inc.

- Royal Elmore has been named director or corporate development and president of Respicare, Inc., a Comtrac subsidiary.

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Commerce Sees DP Sales Strong for Next Five Years, Though Slower This Year

By Jake Kirchner

CW Washington Bureau

WASHINGTON, D.C. — Computer industry sales will remain strong through the next five years, although 1980 shipments will show some downturn in growth rate compared with 1979, reflecting a slackening in the U.S. economy, the Commerce Department said recently.

Computer shipments are expected to reach \$23.3 billion in 1980, a 10% increase over 1979, the department reported in its annual "U.S. Industrial Outlook" study.

Sales of computers and related equipment were \$20.9 billion in 1979, up 22% over 1978.

Despite the presently sluggish economy, industry sales will grow at an average yearly rate of 12% through 1984, the report predicted. "Historically high order backlogs" should sustain the industry through this period, Commerce said, noting that delivery schedules in some cases stretch into 1983.

The forecasted 12% annual growth rate in sales, while healthy, is markedly below the 26% annual rate the in-

dustry enjoyed in the 1976 to 1979 period.

Trends Affecting Profits

Current trends adversely affecting industry profits include a labor shortage — particularly of programmers and systems analysts — that is pressuring

Japanese Exports Growing

WASHINGTON, D.C. — Comparing U.S. and Japanese computer exports in its latest "U.S. Industrial Outlook" report, the U.S. Department of Commerce said that although the U.S. continues to outpace Japan, Japanese exports grew at an average annual rate of 36% between 1972 and 1978, nearly twice the U.S. rate.

The current 8% ratio of exports to

domestic production in Japan is slated to increase through the coming decade; the Japanese government has set a goal of exporting 16% of its computer production by 1985.

"This goal may turn out to be conservative," Commerce added, "because several leading Japanese computer firms have reportedly established export goals as high as 30%."

salaries upward and a slight increase in chip prices because of shortages of 16K RAMs.

The study calls the increase in chip prices "uncharacteristic" and said it will not have much effect on computer system prices in the next few years.

Through 1984, semiconductor sales will increase an average of 13.4% annually, which represents a leveling off of their "spectacular growth" in 1979, when sales of integrated circuits alone were more than \$5 billion, up 29% over 1978.

The figures for the electronic components industry as a whole will show an expected downturn to \$19.4 billion in sales this year, a decrease of 4% from last year's figures. Over the next five years, however, components sales should increase about 9.4% annually.

Balance of Trade

Reporting on the computer industry's balance of trade, the Commerce Department said exports increased 27% between 1978 and 1979, reaching an estimated \$5.3 billion last year, almost 25% of the value of domestic shipments.

The export growth rate should decline to 16% this year and total \$6.1 billion in sales. "The decline should be cushioned by the lag in the business cycles of many foreign economies relative to that of the United States," the study added.

On the import side of the scale, approximately \$490 million in computer equipment, excluding parts, was imported into the U.S. last year, an increase of 29% over the previous year. When parts are included, imports were almost double that dollar amount, reaching \$960 million, about 6% of the U.S. market.

Japan, with almost 24% of the total increase, was the principal source of these imports, followed by Canada and France, which had shares of 21% and 14% respectively.

Slower This Year

In 1980, computer equipment imports should slow sharply, showing only a 10% growth rate over 1979, for a projected dollar total of \$1.1 billion, according to the report.

But the U.S. is already running a trade deficit with Japan in integrated circuits, and that deficit is increasing, predicted to reach approximately \$30 million for 1979 when the final figures are compiled, the study said.

For all components, the U.S. showed a 55% growth in its component trade surplus in 1979, with exports exceeding imports by \$510 million. This was the first increase in components, trade surplus since 1976, the study added, although some of the surplus is attributed to offshore manufacturing and assembly of components particularly semiconductors, imported back into the country.

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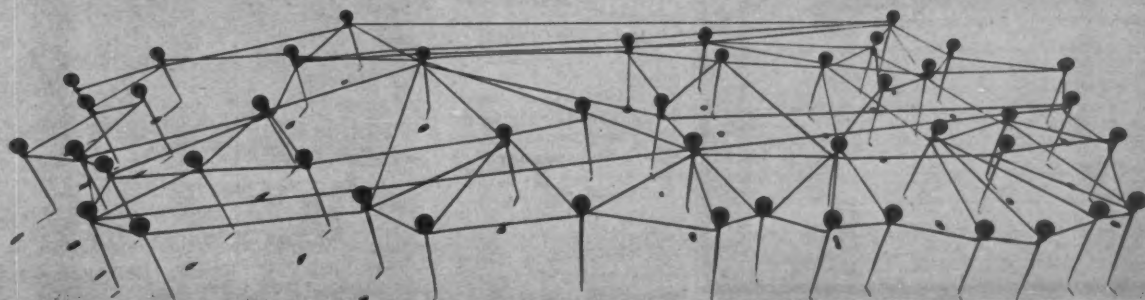
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SBS Orbit Seen Changing Course

(Continued from Page 79) Fortunately for SBS, its management has already shown some signs of recognizing that the firm will have to change its business direction if it wants to achieve its long-term market objectives, Anderson said.

Growing Independence

At the same time, the company has also begun to demonstrate a growing sense of management independence from its financial backers, particularly IBM. At one time, SBS and IBM moved virtually in lock step — but no more.

Today, the two firms "are moving in different directions," with SBS increasingly

acting in its own best interests, regardless of the impact on IBM, Anderson claimed.

SBS' growing insistence on being its own master might prompt IBM to withdraw its financial support from the smaller company and sell its SBS stock.

If so, the budding communications firm might be forced to finance its future growth through sources other than its original partners, Anderson theorized.

Anderson told his listeners that SBS' growth during the next five years would probably come in three phases.

During the first phase, which will begin next year, the

firm will focus its business primarily on bulk data transfer and will serve mainly as a supplier of wideband digital links.

By 1982, the company will move into its second developmental phase, increasingly acting as a consulting firm for private data networks, Anderson predicted.

SBS will continue to provide wideband digital links during its second phase, but it will also be forced by market pressures to become more involved in specifying its customers' communications needs.

Systems Supplier

By 1985, Anderson continued, the firm will find itself unable to provide some of the products its users will need to solve their data communications problems.

The company will then be forced either to make those products itself or buy them from other manufacturers. The moment SBS becomes a systems supplier, it will enter the third phase of its expected corporate development, Anderson said.

As SBS matures as a company, its revenues are expected to grow. After reaching the \$50 million mark next year, the firm's sales are projected to total \$500 million in 1985 and \$1 billion in 1980, Anderson said.

Adapso to Host World Congress In San Francisco

ARLINGTON, Va. — The Association of Data Processing Service Organizations (Adapso) will host the Second World Computing Industry Congress in San Francisco at the St. Francis Hotel on June 23-25.

More than 1,000 people from 50 countries are expected to attend and participate in the congress, which will feature panels on multinational management and marketing, union relations, productivity and future technology.

Weiss to Chair

Robert Weissman, president of National CSS, Inc., is the chairman of the conference's International Program Committee.

Adapso is cosponsoring the congress with the Canadian Association of Data Processing Service Organizations, the European Computing Services Association and the Japanese Software Industry Association.

Further information may be obtained from Thomas V. Farewell, assistant to the executive vice-president, Adapso, Suite 1100, 1925 N. Lynn St., Arlington, Va. 22209.

Graphics Suppliers Listed

CAMBRIDGE, Mass. — A directory devoted to computer graphics suppliers is available from "The Harvard Newsletter on Computer Graphics," a new biweekly periodical published by the Harvard University Laboratory for Computer Graphics here.

The 1980 directory will serve both the first-time computer graphics user and vendor as well as those already in the field. This year's edition lists 135 suppliers, including name, address, telephone number, the name of an individual to contact and a summary of products and services. It also includes data on sales,

year founded, officers and number of employees of the hardware manufacturers and software and services suppliers.

The directory costs \$17 prepaid in the U.S. and \$19 in Canada and Mexico. A free copy is included with an annual subscription to the newsletter.

More information on "The 1980 Directory of Computer Graphics Suppliers: Hardware, Systems, Software and Services" may be obtained from Directory Department, The Harvard Newsletter on Computer Graphics, P.O. Box 89, Sudbury, Mass. 01776.

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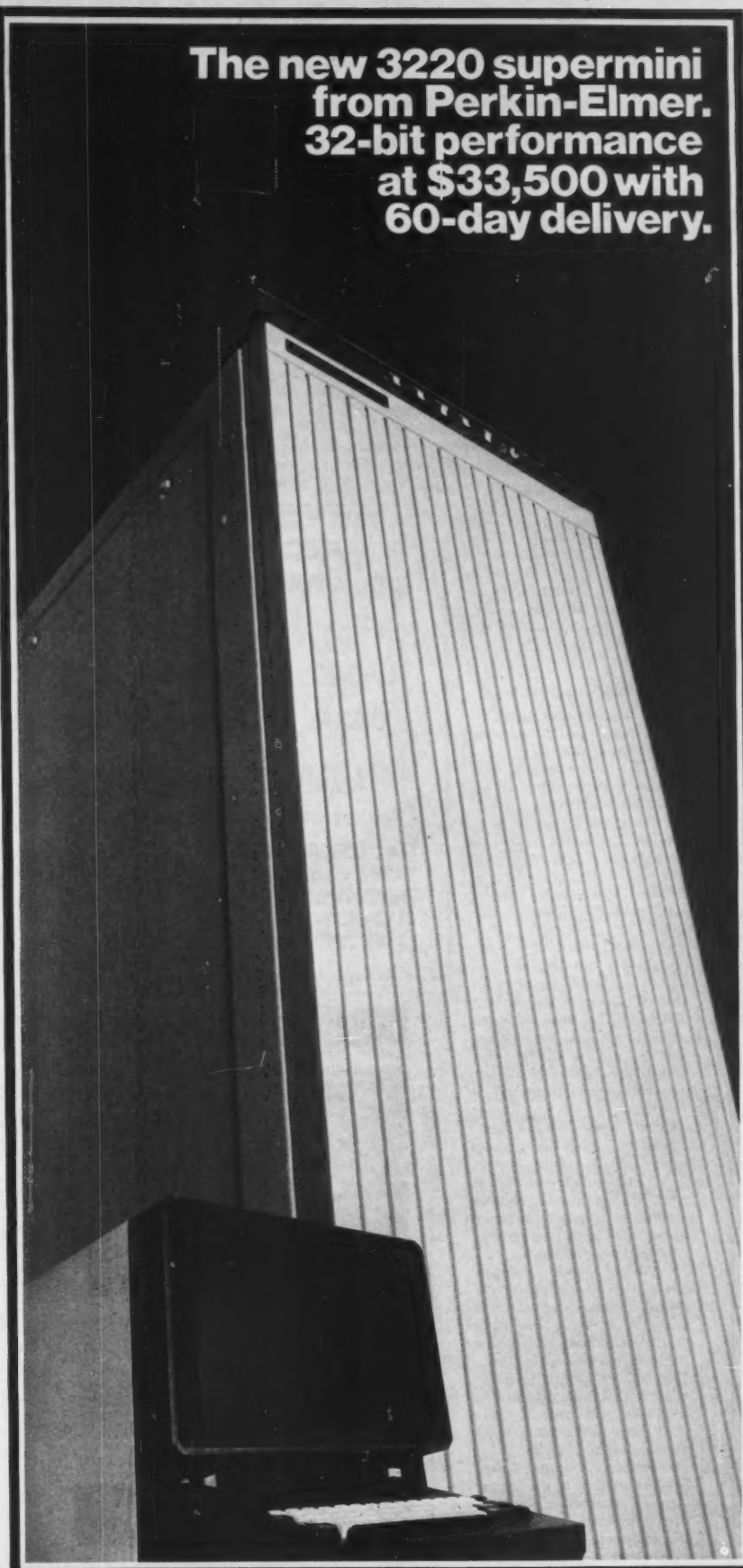
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Survey Cites Keen Competition in European DP

By Connie Winkler

CW Staff

NEW YORK — Pressures to improve productivity in European business will lead to a strong and rising demand for all types of computers in the 1980s. However, because of preference for local manufacturers, competition is keen.

A recent survey of American and European computer manufacturers by Martin Simpson Research Associates, Inc. found customers turning to computers in these times of modest growth to combat very high labor costs.

Protective labor legislation

makes it difficult and expensive to lay off workers. This is particularly the case in the UK, now readjusting its economy under the Conservative party.

The survey, "The European Computer and Office Equipment Market: Trends and Outlook for the 1980s," includes observations made during European visits in late 1979 and covers 11 manufacturers.

The security analysts found:

- Less IBM computer leasing in Europe. There was already more overall leasing in Europe, according to Frank

Halpern of Martin Simpson Research, one of the study's authors.

In addition, IBM's 4331 and 4341 had a greater impact on orders than the previous Series 30 announcement because intermediate machines account for a larger share of IBM's installed base in Europe than in the U.S.

As a result of the 4300 announcement, bookings are ahead of 1978 for IBM Europe/Middle East/Africa.

- A shortage of components was overcome by CII Honeywell Bull in the fourth quarter, but it still held computer shipments to only about a 20% increase for 1979, Halpern said.

- The Japanese have entered the European fray. Fujitsu is now supplying Siemens AG's large computers, and Hitachi, Ltd. has a marketing agreement to supply Olivetti Corp.

- The research firm guesses IBM will soon market a version of the European 1750 PBX in the U.S. The 1750, a small branch exchange network, was introduced in Europe in 1979 and has been well received in the UK, France and Italy.

Major Competitors

The report highlights the posture of major companies competing in Europe:

- **CII Honeywell Bull.** French government subsidies have helped the company's financial picture, but the 1980 amount, 20 million francs, is considerably less than the 110-million-franc subsidy in 1979. This will limit gain in net income to between 8% and 10%.

- **Univac, International Division.** The International Division has been a factor in the overall growth of Univac that reflects the less mature foreign markets. Compound revenue growth rate for 1974-79 was 17.6% vs. 12% domestically, and 10% in defense and space revenues.

- **IBM Europe/Middle East/Africa.** This group should grow 10% in revenues and 12% in profits, benefiting from the trend to purchase and from foreign currency gains. IBM also had components supply problems.

- **Amdahl Corp.** Amdahl has about 50 computers installed overseas with Europe probably getting another 40 to 50 of the 200 machines to be shipped worldwide in 1980. The research group, however, expects new installations "to level off and probably decline" once IBM announces its more powerful H series.

- **Nixdorf Computer Corp.** Seventy percent of the largest German companies use Nixdorf computers, and for 1980 the profitable concern anticipates revenue growth of 20% in deutsche marks, assuming a

five percent inflation rate.

Nixdorf's end-user orientation makes it particularly positioned in some of the fastest growing segments of the DP industry.

- **Wang Laboratories, Inc.** "Wang Laboratories' European business has been considerably weaker than the strong performance experienced domestically," the report said. Internal factors such as lack of management direction and insufficient corporate support are said to be responsible.

In recent months, six of seven Wang general managers have been replaced. Estimated European revenues for fiscal year 1980 are likely to increase by 50%.

- **Tandem Computers, Inc.** Tandem's German subsidiary contributed \$10 million to

Tandem's total revenues of \$55 million in 1979, and explosive growth is expected again in 1980. Tandem also bucked the trend of minicomputer companies to build in Ireland and instead established a 25,000 sq ft plant in Munich.

- **Texas Instruments, Inc.** (TI) wants to outpace the European market growth rate of 10% and particularly for minicomputers expects to exceed the 30% to 40% industry growth rate.

TI's intelligent terminal business has been generally good, but hurt by communications costs in Germany and poor networks in Spain and Italy, the researchers claimed.

The report costs \$395 from Martin Simpson Research Associates, Inc., 115 Broadway, New York, N.Y. 10006.



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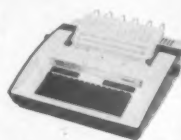
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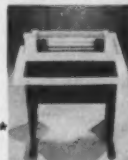
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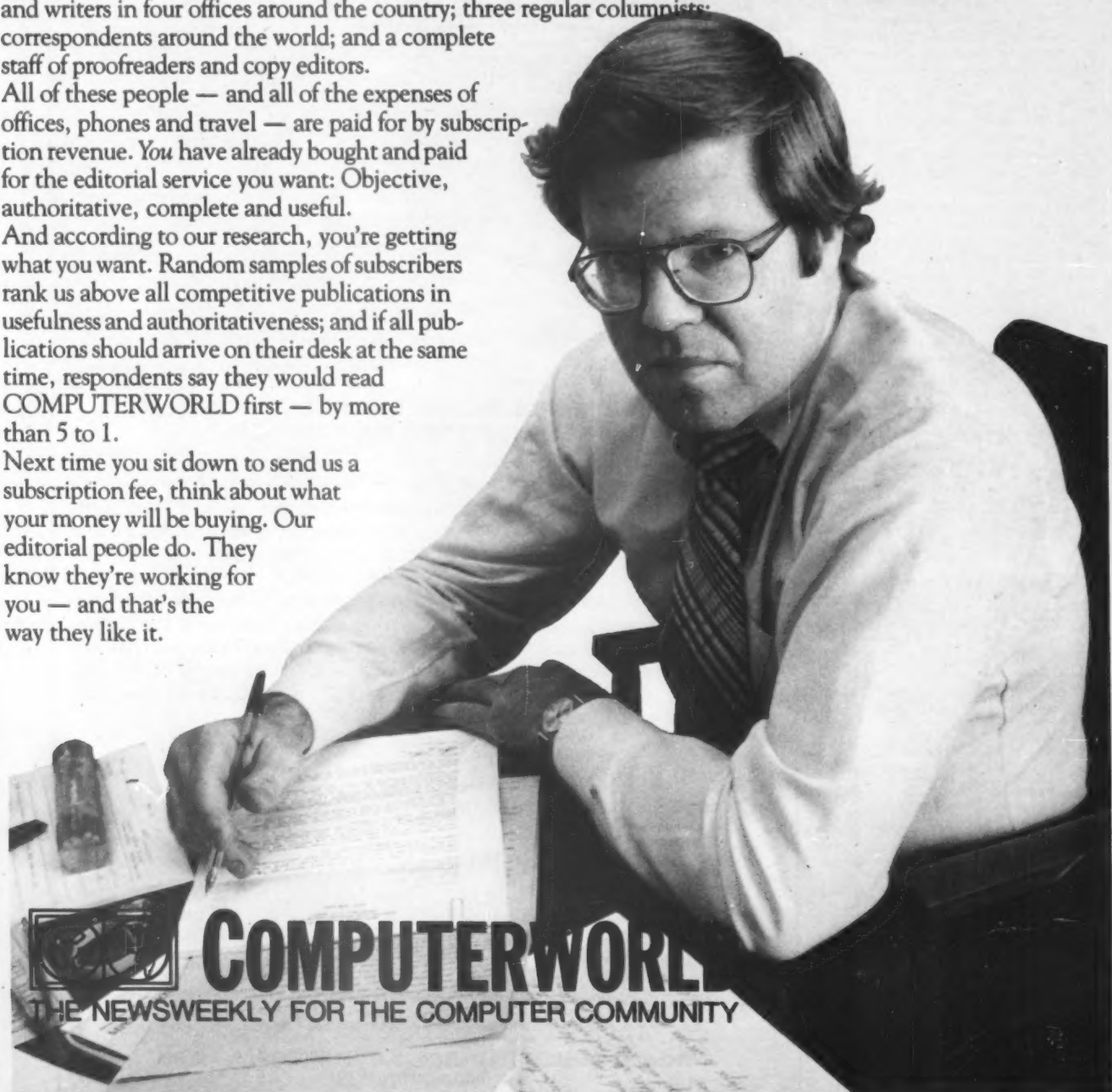
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—will prepare command center and training institute equipment configuration, integrate procured equipment into final CC configuration. Requires at least 2 years experience including documentation and A/V systems in support of command center applications. Communications and ADP experience desirable. BS in EE or equivalent.

COMMAND CENTER DESIGN ENGINEER

—to participate in hardware design, equipment and system implementation, testing, documentation, etc. Requires at least 2 years experience related to military command center, audiovisual, television studio operation and maintenance. BSEE or equivalent.

COMPUTER SCIENTIST

—to perform modifications to computer terminal firmware and development of downline load code; acceptance of terminal firmware from vendors. Requires at least 7 years experience including microprocessor firmware design and development, driver level code production, specification preparation and communication terminals. BS/BA in CS or Engineering.

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—to prepare QA plans for acceptance of equipment procured for the system, and to assist in the preparation of

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SENIOR ENGINEER

—to specify and direct modification of programmable terminal and terminal peripherals, and terminal modifications. Requires at least 4 years experience including microprocessor peripheral interface development, digital design and diagnostic software development. BSEE.

SENIOR SOFTWARE SYSTEMS ENGINEER

—to assume major responsibility in the functional design of an on-line subsystem followed by detailed design and development. Requires BS/BA, MS or equivalent and at least 6 years experience in analysis and COBOL programming in a commercial business application environment. Must have had major responsibilities for completion of a system.

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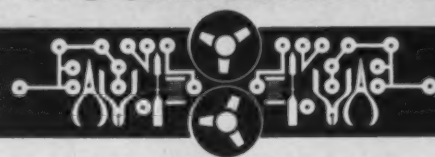
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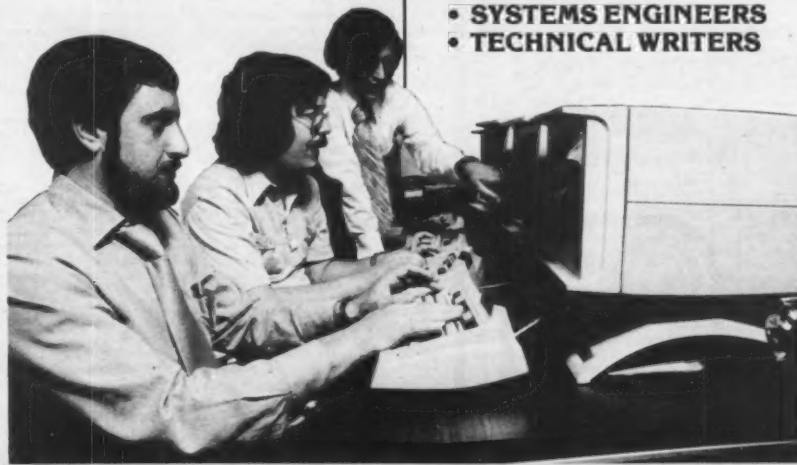


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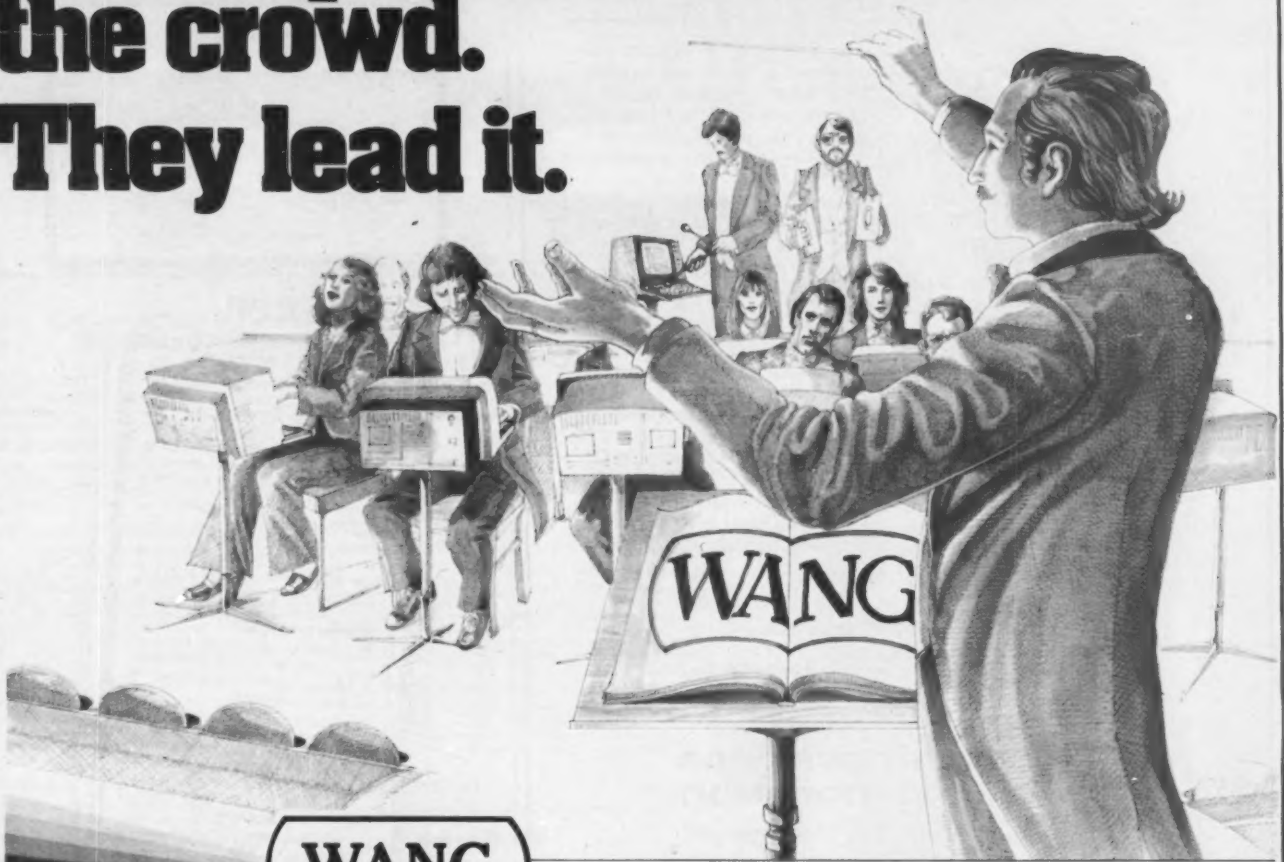
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A number of challenging positions exist for experienced system-oriented software professionals in the VS System Integration Department. Working directly in the Advanced Computer Systems Development Center on Wang's highly successful 32-bit virtual memory VS computer line, our charter is to provide system evaluation and development plans where appropriate to significantly improve product reliability, functionality, ease of use, and user-model simplicity and consistency. This work includes requirements analysis, functional specification, software development, and coordination of development activities to meet specific product level requirements.

Current projects include system generation procedures simplification, improved data-structure redundancy and recoverability, self-adjustment techniques for performance optimization, improved system security, and repackaging of major software tools to provide sophisticated user service environments.

Candidates for these positions should have 3 to 15 years of systems programming experience, good working knowledge of state-of-the-art system software concepts, excellent communication skills, and some familiarity with the commercial EDP marketplace.

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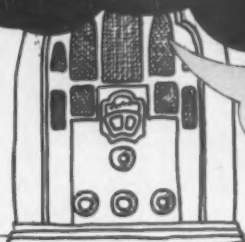
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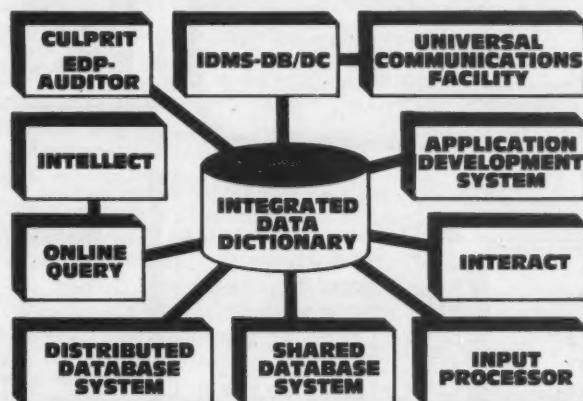
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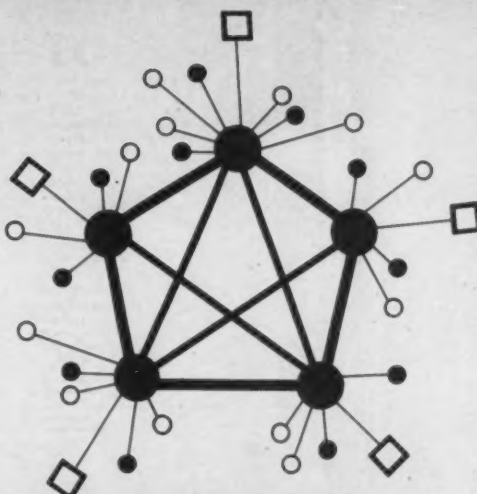
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- **DEC:** PDP-11/34, 11/70, VAX 11/780; FORTRAN, Assembly
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All positions require appropriate degrees. Some travel is to be anticipated. Send resume, including salary history, in complete confidence to:

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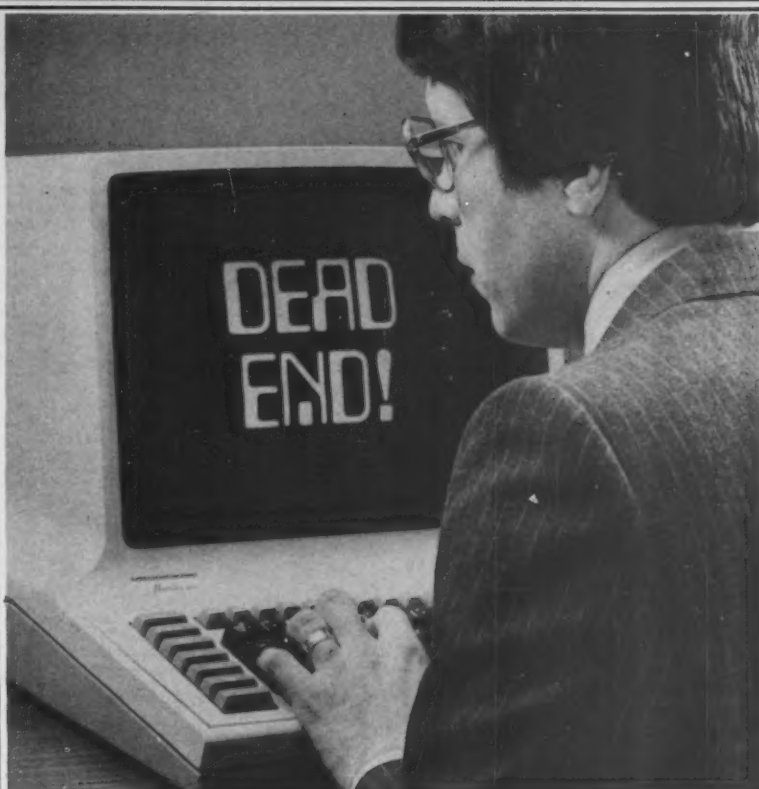
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If you are interested in tackling exciting state-of-the-art challenge, please forward your resume, complete with salary history, to Jack Erie, Digital Equipment Corporation, Dept. A0225 3807, 1925 Andover Street, Tewksbury, Massachusetts 01876. We are an equal opportunity employer m/f.

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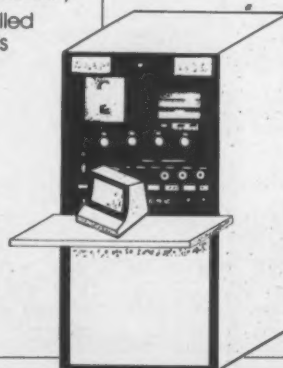
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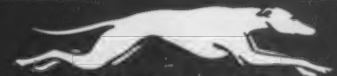
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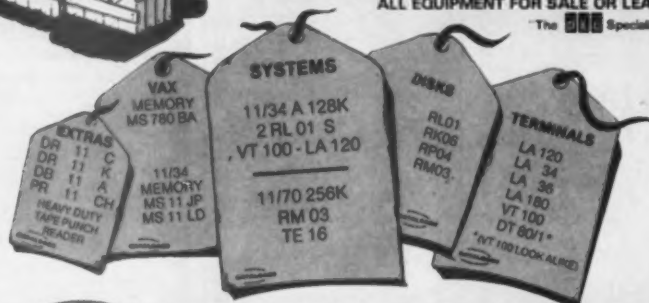
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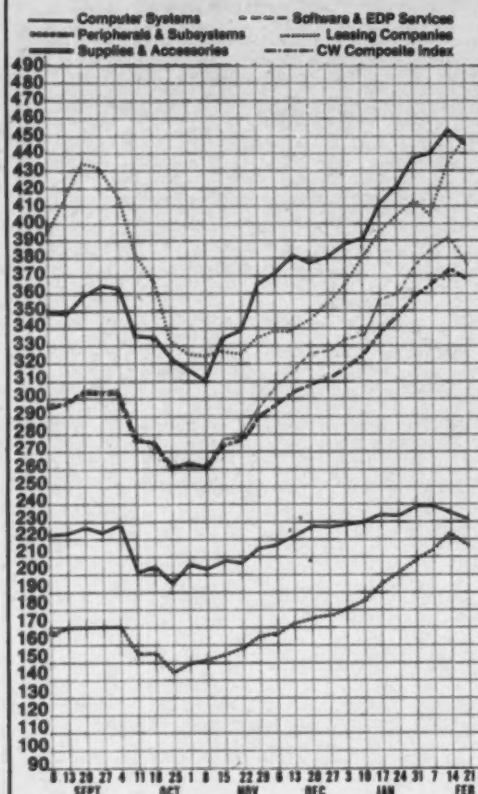
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Computerworld Stock Trading Summary

CLOSING PRICES WEDNESDAY, FEBRUARY 20, 1980

All statistics compiled,
computed and formatted
by
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Cambridge, Mass. 02130

PRICE					PRICE					PRICE				
1979-80 RANGE (1)	CLOSE FEB 20 1980	WEEK NET CHANGE	WEEK PCT CHANGE		1979-80 RANGE (1)	CLOSE FEB 20 1980	WEEK NET CHANGE	WEEK PCT CHANGE		1979-80 RANGE (1)	CLOSE FEB 20 1980	WEEK NET CHANGE	WEEK PCT CHANGE	
COMPUTER SYSTEMS					SOFTWARE & DES SERVICES					SUPPLIES & ACCESSORIES				
A ARCADIS CORP	17-60	29 3/8	- 3/4	-2.4	O ADVANCED COP TECH	1-2	1	0	0.0	A DATA ACCESS SYSTEMS	0-13	11 7/8	+ 1/4	+2.1
N BURROUGHS CORP	59-87	78 3/8	-1 3/8	-1.7	O ANACORP INC	8-24	18 1/2	-1 1/2	-7.5	A DATA PRODUCTS CORP	12-25	20 7/8	-1 1/2	-6.7
O COMPUTER AUTOMATION	9-44	19 1/2	- 3/4	-3.7	O ANALYSTS INTL CORP	3-6	5 5/8	- 1/8	-2.1	O DATUM INC	2-6	2 1/2	0	0.0
N CONTROL DATA CORP	23-61	58 7/8	-2 1/8	-3.4	A APPLIED DATA RES.	8-17	12 1/4	- 3/8	-2.9	O DECISION DATA COMPUT	2-6	2 1/2	- 1/4	-9.0
O CRAY RESEARCH INC	8-58	54 1/2	- 3/2	-5.2	N AUTOMATIC DATA PROC	24-48	38 7/8	-1 3/8	-3.5	O DELTA DATA SYSTEMS	1-2	2 7/8	- 1/4	-8.0
A DATA GENERAL CORP	62-76	66	+ 3/8	+8.5	O COMPU-SERV NETWORK	5-19	19 1/4	0	0.0	N DOCUMENTATION INC	0-34	13 3/4	+ 1/4	+1.8
N DATAPoint CORP	34-122	121 1/2	+ 3/8	+2.8	O COMPUTER HORIZONS	1-9	4	0	0.0	O DATARAH CORP	0-38	31 1/4	+ 3/4	+2.2
N DIGITAL EQUIPMENT	39-88	79 1/2	+ 7/8	+1.1	O COMPUTER NETWORK	5-16	8 1/2	- 3/4	-10.3	N ELECTRONIC M & H	3-9	5 1/4	+ 1/4	+4.4
A ELECTRONIC ASSOC.	2-13	10	- 1/4	-2.4	N COMPUTER SCIENCES	8-24	21 1/2	-1 3/8	-6.8	O EVANS & SUTHERLAND	20-58	40	-1	-2.0
A ELECTRONIC ENGINEER.	9-19	15 3/4	- 3/4	-5.5	O COMPUTER TASK GROUP	1-8	8 1/2	0	0.0	O FARRI-TEK	1-2	2 3/4	+ 1/4	+5.5
N FOUR-PHASE SYSTEMS	19-67	35	-2 7/8	-7.5	O COMPUTER USAGE	2-5	4 1/2	- 1/4	-5.2	O GENERAL COMPUTER SYS	1-3	3 3/8	+ 1/4	+5.5
N FURBER	28-44	40 1/2	-1 1/4	-2.9	O COMPUT AUTO REP SVC	4-10	8 1/2	- 3/4	-12.6	O GENERAL DATACOM INC	8-24	34	0	0.0
O GENERAL AUTOMATION	7-26	18 7/8	-1 3/8	-7.8	O COSHARE	8-26	17 1/4	- 3/4	-4.1	N HAZELTINE CORP	10-20	24	+ 1/2	+1.0
O GRI COMPUTER CORP.	1-3	5/8	0	0.0	O CULLINANE CORP	1-33	32	-1	-3.0	N HARRIS CORP	17-30	37	-1 1/8	-2.9
N HEWLETT-PACKARD CO	24-70	69 3/4	+ 1/8	+0.1	O DATA DIMENSIONS INC	1-9	1 5/8	- 1/4	-7.1	O INFORCOR INC	1-11	1 3/4	+ 1/4	+7.6
N HONEYWELL INC	43-100	99 1/2	+ 8 1/4	+9.0	O DATATAB	1-4	1 1/4	0	0.0	N INFORMATION INTL INC	7-15	13 1/4	- 1/4	-7.0
N IBM	62-321	87 1/4	-2 1/8	-3.0	O OSI CORP	4-9	7 3/4	- 1/2	-6.0	O INFOTON	1-4	2 7/8	- 1/4	-8.0
N MANAGEMENT ASSIST	9-29	29 1/2	+ 1/4	+1.2	N ELECTRONIC DATA SYS.	15-20	25 7/8	- 3/8	-1.4	O INTEL CORP	28-75	72 1/2	-1 1/2	-2.0
O MANUFACTURING DATA S	9-38	31 3/4	-2	-5.9	O INVSTY CORP	1-3	1 5/8	0	0.0	O INTERSLI	7-32	28 3/4	0	0.0
O MINI-COMPUTER SYST	2-8	4 5/8	- 3/8	-7.5	O IPS COMPUTER MARKET.	2-3	3 1/4	0	0.0					
O MODULAR COMPUTER SYS	7-18	13 3/4	+ 1/8	+0.9	O KEANE ASSOCIATES	3-9	8 1/2	0	0.0	A LUNDY ELECTRONICS	4-11	6 7/8	-1	-10.1
N NCR	37-81	80 5/8	+ 7/8	+1.0	O KEYDATA CORP	1-5	4 5/8	- 1/4	-5.1	O MSI DATA CORP	0-19	10 1/4	- 1/2	-4.7
N PRIME COMPUTER INC	9-29	27	-1	-3.5	A LOGICON	10-23	21 3/4	- 1/4	-1.1	N HENDRIX	17-59	56 3/4	- 1/2	-2.8
N PERKIN-ELMER	17-47	46 1/4	- 3/4	-3.3	O NATIONAL DATA CORP	7-19	16 7/8	-1 1/4	-6.2	N NODARK DATA SCI	0-29	19 3/4	-1 1/8	-6.0
N SPERRY RAND	33-60	55 1/2	-1 3/4	-3.0	N PLANNING RESEARCH	4-10	7 1/2	- 5/8	-7.0	O DME	2-8	9	0	0.0
A SYSTEMS ENVS. LABS	11-24	19	- 5/8	-3.1	O PROGRAMMED TAR SYS	3-5	5	0	0.0	O PARADYNE CORP	9-34	33 1/2	+ 1/2	+1.5
O TANDEN COMPUTERS INC	13-54	51 1/4	-3	-5.5	O PROGRAMMING & SYS	1-1	1 7/8	0	0.0	O PENNELL CORP	5-15	11 1/2	- 1/2	-2.5
N TEXAS INSTRUMENTS	78-180	181 1/2	+5 1/2	+5.1	O RAPIDATA INC	3-7	5 1/2	0	0.0	O POTTER INFLUENT	2-2	1 3/4	0	0.0
A WANG LABS.	6-40	37	-2 1/2	-6.3	O REYNOLDS & REYNOLD	10-36	30 1/4	+ 1/2	+1.0	O RANTCH CORP	7-10	16 1/4	0	0.0
					O SCIENTIFIC COMPUTERS	3-16	14 3/4	-1	-6.3	O RECOGNITION EQUIP	5-13	10 1/4	- 3/4	-3.5
					N TYMSHARE INC	10-57	56	+ 1/2	+0.4	O SCAN DATA	1-5	2 5/8	+ 1/4	+8.0
					A URS SYSTEMS	5-12	11 1/2	+ 1/4	+1.0	N STORAGE TECHNOLOGY	14-46	16 1/4	+ 7/8	+5.0
					N WYLY CORP	1-9	7 1/4	-1	-12.1	O SVKES DATATECHNICS	4-29	27 1/4	-1 3/4	-6.0
LEASING COMPANIES					PERIPHERALS & SUBSYSTEMS									
O BOOTHE FINANCIAL CP	13-21	16 1/2	0	0.0	N AN INTERNATIONAL	13-32	17 1/4	- 5/8	-3.5	A TFC INC	6-13	6	+ 1/4	+2.0
O COMDISCO INC	3-21	13 7/8	+ 5/8	+4.3	N ANDERSON JACOBSON	3-10	14 3/4	+1 3/8	+8.7	N TELEX	3-9	4 1/4	- 3/4	-9.1
A COMMERCE SHARE ENVP	1-1	1 1/2	+ 3/8	+31.3	N APPLIED OIG DATA SYS	8-22	4 5/8	- 1/4	-2.8	O TESDATA SYSTEMS CP	0-26	12 3/4	-1 1/2	-10.5
A COMPUTER INVESTS GRP	1-7	3 1/4	+ 1/4	+4.1	O AUTO-TRAC TECHNOLOGY	14-39	36	- 1/2	-1.3	O TIMEPLEX INC	0-14	13 3/4	+ 1/8	+0.6
O CONTINENTAL INFO SYS	3-15	3 3/4	0	0.0	O BECHTEL INTL	3-8	7 5/8	- 1/4	-1.6	O WILTEK INC	1-2	3 1/4	0	0.0
N DATACORP RENTAL	1-4	2 5/8	+ 1/4	+10.5	A BOLT-REHANEK & NEW	8-22	21 1/4	- 3/4	-1.7	SUPPLIES & ACCESSORIES				
A DCL INC	3-8	5 1/4	0	0.0	N BURRER-RAND	10-32	27 5/8	-2 1/4	-7.1	A AMERICAN BUS PRODS	0-12	10 7/8	+ 1/8	+1.1
N DPF INC	7-14	6 3/4	- 1/2	-6.8	O CAMBRIDGE MEMORIES	1-9	2 1/2	- 1/4	-6.7	O BALTIMORE BUS FORMS	1-4	1	0	0.0
N ITEL	4-36	4 1/4	- 1/4	-5.5	O COMPUTER DEVICES INC	3-9	8 1/4	- 1/4	-1.5	N HARRY WHIGHT	14-34	27 1/4	+ 1/8	+0.4
N LEASCO CORP	24-73	71 1/2	+3 1/2	+5.1	N TYMSHARE INC	10-57	56	+ 1/2	+0.4	O CYBERNETICS INC	1-1	13 3/4	0	0.0
O LEASAPAC CORP	1-4	1 1/4	0	0.0	O COGNITRONICS	1-4	3 1/4	- 1/4	-3.8	O DUPLEX PRODUCTS INC	13-31	26 3/4	-1	-3.0
A PIONEER TIA CORP	1-7	3 5/8	0	0.0	O COMPUTER CONSOLE	4-25	5 3/4	+2 1/2	+10.9	N ENNIS BUS. FORMS	5-21	15 5/8	- 1/4	-1.5
N U.S. LEASING	12-29	14 1/4	- 7/8	-5.8	A COMPUTER EQUIPMENT	3-7	7 3/4	+ 7/8	+13.4	N JH COMPANY	42-66	52 3/4	-1 1/2	-2.0
					O COMPUTER TRANSCIVER	1-5	3	- 1/4	-7.0	O KODAK CORP LTD	26-34	31 1/4	- 1/2	-1.5
					O COMPUTECON CORP	3-6	5 3/4	+ 5/8	+6.5	N NASHUA CORP	10-37	29 7/8	- 3/4	-2.4
					N COMVAC CORP	13-26	23	-1 1/4	-6.0	O STANDARD REGISTER	20-29	27 1/2	- 1/2	-1.8
										A TAP PRODUCTS CO	0-28	25 1/4	-1 1/4	-5.5
										N HANSHAW MAGNETICS	10-22	13 1/2	- 3/4	-2.7
										N WALLACE BUS FORMS	10-33	29 1/2	- 1/4	-0.6

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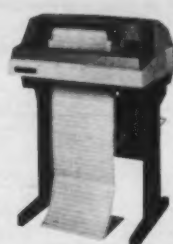
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